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EVALUATION OF DECENTRALIZATION OUTCOMES IN INDONESIA:
ANALYSIS OF HEALTH AND EDUCATION SECTORS

By

RENTANIDA RENATA SIMATUPANG

A Dissertation Submitted in Partial Fulfillment
of the Requirements for the Degree
of
Doctor of Philosophy
in the
Andrew Young School of Policy Studies
of
Georgia State University

GEORGIA STATE UNIVERSITY
2009

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ACCEPTANCE

This dissertation was prepared under the direction of the candidate's Dissertation Committee. It has been approved and accepted by all members of that committee, and it has been accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Economics in the Andrew Young School of Policy Studies of Georgia State University.

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ABSTRACT

EVALUATION OF DECENTRALIZATION OUTCOMES IN INDONESIA: ANALYSIS OF HEALTH AND EDUCATION SECTORS

By

RENTANIDA RENATA SIMATUPANG

December, 2009

Committee Chair: Dr. Jorge L. Martinez-Vazquez

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This study examines the performance of decentralized health and education service delivery in Indonesia. Results show that education outcomes improved with decentralization, and that local governments are responding to local needs for education services. Decentralization also brings improvement to health services, as mortality rates and life expectancy are significantly improved with decentralization. However, results indicate that decentralization does not improve availability of health services, as only small percentage of municipalities in Indonesia have access to health facilities.

The empirical study on the performance of proliferated municipalities provides similar conclusions to those obtained in the examination of general decentralization performance. Proliferated municipalities experience improvement in education outcomes but not so for health outcomes; these results are consistent with the previous examination. Therefore, from the result of this study, there is no evidence to reject proliferation as it does not hurt health and education service delivery outcomes.

CHAPTER I

INTRODUCTION

Over the last three decades, decentralization has become a worldwide phenomenon that captured developed and developing countries alike. Countries around the world use decentralization principles with varying degrees, mostly by transferring responsibilities of public service delivery to lower levels of government. This study seeks to examine the effect of decentralization reform on service delivery in Indonesia, specifically for health and education services. Previously known as one of the most centralized countries in the world, Indonesia has moved to be one of the most decentralized ones in relatively short period since the implementation of decentralization in 2001. This reform brought provinces and municipalities to demand more autonomy, which resulted in the creation of new jurisdictions all over the country. The proliferation of sub national governments has significantly increased the number of sub national governments, from 26 provinces and 313 municipalities in 1999 to 33 provinces with 454 municipalities in 2007.

The well-known decentralization theorem (Oates 1972) argued that decentralization can improve *allocative efficiency* by bringing greater diversity into the supply of public services, thus will be able to serve heterogeneous preferences for public goods. This is known as the preference-matching argument. Second, decentralization is also argued to increase the *productive efficiency* of delivery of government services. The proponents of decentralization argued that decentralization could raise the political participation of the constituents, which would make local governments to be more responsive than central government to local needs (Wallis and Oates 1988; Shah 1999). But critics dispute that the decentralization theorem may not applicable

in developing countries, as most developing countries do not meet the assumptions posed by decentralization theorem (Bahl and Linn 1992). Local governments maybe too vulnerable to elite capture, have limited technical, human and financial resources, lack of accountability and are too corrupt to provide public goods to efficiently answer local demand (Prud'homme 1995; Crook and Sverrisson 1999; Tanzi, Bruno, and Pleskovic 1996; Bardhan and Mookherjee 2006).

Despite of a growing literature on decentralization, there is limited empirical evidence that countries with decentralized public service delivery have also improved the efficiency and physical outcomes of public services. The majority of the past studies have focused on how decentralization affects economic outcomes (economic growth, inflation, income per capita) and fiscal outcomes (tax revenues, intergovernmental transfers). Empirical evidence on relationship between decentralization and real outcomes are remarkably few.

Motivation

The decentralization process in Indonesia is still in its infancy after the reform which became known as the „Big Bang“ of decentralization in reform 2001. Although the reform seems to be rushed, many observers, including The World Bank, think that decentralization in Indonesia started off much better than expected.¹ Since then, the decentralization process in Indonesia has caught international the attention and it is often mentioned in the studies of decentralization in developing countries as an example of both good and not so good practice. There exists a substantial amount of literature on Indonesia decentralization process, this literature mainly focused on the fiscal design of decentralization system such as expenditure and revenue assignment and also the intergovernmental transfer system. But even with much attention given to the decentralization process and implementation in Indonesia, the topic of

¹ Hofman and Kaiser (2004)

outcomes of decentralization did not receive proper attention. After almost a decade into decentralization era in Indonesia, it is important to assess whether decentralization has improved the efficiency of public spending by looking with some depth at the indicators or outputs from decentralized expenditures.

The recent development of local government proliferation has raised concerns over the past few years, since many see the phenomenon as unjustified and harmful. With the raising arguments about proliferation, the Government of Indonesia has applied more stringent requirements for new local government creation in 2004, which at that time had stopped the proliferation for a few years before amendment of proliferation law in 2007. While there is much debate about proliferation in Indonesia, there are only a limited number of empirical studies that systematically examine the effect of proliferation on sub-national government efficiency.

The purpose of this study are: (i) to examine how decentralization has affected health and education service delivery in Indonesia; (ii) to analyze whether decentralization improved the allocative efficiency of government expenditures by better matching public services with local needs; (iii) to examine the performance of proliferated or fragmented local governments in providing health and education services.

Overview of the Dissertation

The remainder of this dissertation will be organized in the following manner: Chapter II presents a short history of decentralization and local government proliferation in Indonesia. Chapter III provides a review of the existing literature on decentralized service delivery, and a brief description of the education system and health services in Indonesia. The next Chapter IV presents the theoretical model, followed by the empirical model and data sources and the

empirical specifications. The results from the estimations are presented in Chapter V. The last chapter presents the conclusions, policy implications and suggestions for further research.

CHAPTER II

DECENTRALIZATION SYSTEM IN INDONESIA

History of Decentralization in Indonesia

The Big Bang of decentralization was hardly Indonesia's first attempt to give some autonomy to lower tiers governments.² The first law (Law No. 1/1945) right after the declaration of independence dealt with regional autonomy, while article 18 of the 1945 Constitution established the new republic as a unitary state. In response to the Declaration of Independence, the Dutch colonial authority set up several republics outside of Java and Madura islands to argue that the newly independent Republic of Indonesia was merely a part of Indonesia. This resulted in the birth of United Republics of Indonesia, a federal state within a commonwealth with the Netherlands. Under the federal state, local administration was left to the discretion of each area. The United Republics only lasted for less than a year and with the 1950 Provisional Constitution the state went back to unitary status.

After the integration into the unitary Republic of Indonesia, regions outside of Java and Madura grew discontent with the central government and even attempted rebellions to disintegrate themselves from the Republic. Government then enacted Law No. 1/1957 recognizing "as extensive autonomy as possible" to all three tiers of local governments. But this law was aborted after the outbreak of regional unrest in Sumatra, Sulawesi and West Java. President Soekarno in 1959 declared the reversion to the 1945 constitution and Indonesia went back to centralized system of government.

The idea of local autonomy was brought back by the next president, Soeharto, but the law only passed the People's Consultative Assembly in 1974. Law No. 5/1974 clarified that the

² For more detailed history of decentralization in Indonesia see Hofman and Kaiser (2004) and Siddik (2007)

priority in local autonomy was given to the second level local governments (districts and cities). This law removed first tier local government (provinces) as the focus of local autonomy based on the experience of regional rebellions in the 1950s. In practice, this law was never fully implemented. As the regime aimed for political stability in response to the communist insurgence in 1965, the government became more centralized in many ways. In effect, the government dismantled village communities that have ruled themselves on the basis of common law and instead formed administrative villages called “*desa*.” With the administrative reorganization, the military also established the territorial security system all the way down to the *desa*.

In 1995, an experimental decentralization in 26 provinces took off. Some administrative powers were transferred to lower tiers government but resources were not handed over together with the responsibilities. In the aftermath of the 1997 financial crisis and the fall of Soeharto’s regime, the new president Habibie (Soeharto’s last vice president) was under pressure to deal with growing discontentment from the regions that have been suppressed for so long. Regions with long standing armed conflict histories such as Aceh and East Timor were demanding their independence, and East Timor gained its freedom in 1999.

Without fully evaluating the results of the experiment, the central government moved toward fuller decentralization to pacify local dissatisfaction. The reform was officially started when the Parliament approved the Law concerning Local Administration (Law No. 22/1999) and the Law concerning Financial Balance between the Central and Regions (Law No. 25/1999). Under these laws, decentralization took the following features: greater weight was given to decentralization than to de-concentration; horizontal lines of responsibility were established; there was a clear provision for the allocation of funds from the central to local government; and there was a re-application of common law in village administration. A tight deadline was set for

January 1, 2001, by which the laws of decentralization had to be implemented. This strategy became known as the “Big Bang” decentralization reform in Indonesia.

In addition to Law no. 22/1999, the Government of Indonesia also issued Government Regulation (*Peraturan Pemerintah/PP*) no. 129/2000 concerning the formation, merging and liquidation of local governments. This regulation gives way to political and administrative decentralization, as in the past, the formation of new local governments were mostly the result of top-to-bottom initiatives. With this regulation in effect, the number of sub national government increased substantially after decentralization. Table 1 presents changes in the number of sub national government unit before and after decentralization.

Table 1. Number of provinces and municipalities in Indonesia

Year	Provinces	Municipalities/Cities
1998	27	289
1999-2000*	31	338
2001	31	351
2002	32	388
2003-2007*	33	454

Source: MOHA

* There were no creation of new local governments in year 2000 and 2004-2007

According to PP no. 129/2000, a motion for creation of a new local government requires approval of the Ministry of Home Affairs (Imansyah and Martinez-Vazquez) which will be granted after passing a stringent administrative process. However, PP no. 129/2000 also acknowledges another avenue to proliferation that utilized local political will rather than an administrative process. In this process, the Regional House of Representative (DPRD) appeals directly to the National House of Representatives/ Parliament (DPR) without having to go

through technical and administrative process required by MOHA. As decentralization progressed, this political shortcut was used more often than MOHA's endorsed process, which raised concerns that proliferation has been merely the result of local elites' quest for power over financial resources received by newly created local governments (PERCIK 2008). Table 2 shows the composition of new sub national government by type of creation process. It is apparent that by 2003 there were more new municipalities created through the political shortcut. This direct creation process was even more dominant for formation of new provinces.

Table 2. Creation of new sub national governments by institution controlling the process

Year	Government/MOHA		DPR/ Parliament	
	Province	Municipalities	Province	Municipalities
1999-2000	2	43	3	
2001		12		
2002		37	1	
2003		18		31
2004-2006			1	
2007		5		20
2008*				18
Total	2	115	5	69

Source: MOHA

* as per July 21, 2008

Law no. 22/1999, one of the main law governing decentralization in Indonesia, was later replaced by Law no. 32/2004. This new law brings clarity to sub national government relations that was not addressed specifically in the previous law. Before, there was no clear hierarchical order on the relationship between provincial and municipal governments, which created coordination problem since municipalities were not required to answer to provincial government especially in the matter of new local government creation. This problem was addressed by Law no. 32/2004 which clearly stated the role of provincial administrations as representative of

Central government, thus giving them power to direct and coordinate municipalities within their region. On the other hand, since Governors are now elected by their local constituents (as opposed to being appointed by the President), the provincial governments are now likely to become more accountable locally.

The PP no. 129/2000 concerning the formation, merging and liquidation of local governments was later amended with PP no. 78/2007 which is somewhat more stringent regarding the formation of new local government. For example, it regulates the minimum (administrative) size of new local government and the frequency of fragmentation. The process of new government creation itself is not much different from the previous regulation, in particular, the new PP also allows for the creation of local government directly by Parliament's political will. However, since the provincial government is provided with clear hierarchical order over municipalities, the governor has authority to reject a proliferation proposal that does not meet the minimum requirements. With the new government regulation in effect, the next wave of proliferation is expected to create new local governments with better administrative, fiscal and technical capability.

Understanding determinants of government proliferation in Indonesia

From many extensive studies on decentralization which span over the last three decades, one aspect of decentralization that the literature seems to agree on are factors supporting the presence of decentralization. Bahl and Linn (1992) summarized the results from existing empirical studies and present the determinants of decentralization as: size of country (population or area); stages of development (GDP); and war/crisis effect. However, Oates (1993) argued that this conclusion only applies for developing countries, as empirical evidence shows that more

industrialized countries move toward centralization. Other studies also find that ethnic diversity and urbanization as possible factors to support decentralization, which applies for the case of developing and transitional economies (Bahl and Wallace 2005).

With decentralization reform in progress, many countries experience significant changes in number of sub national government. While some experience amalgamation,³ but the most common phenomenon is the proliferation or creation of new sub national government units. For the case of Indonesia, it is the proliferation (or *pemekaran*) that has been raising concerns nationwide. In many occasions, the proposals of proliferation have caused civil protests, and in some cases these protests ended with anarchy.⁴

While there has been much debate on proliferation, there are only limited numbers of empirical studies that explore the determinants and impact of this phenomenon. Among the first to systematically study the proliferation in Indonesia was Fitrani, Hofman and Kaiser (2005) which observed pre and post decentralization proliferation events. Based on the observation that jurisdiction proliferation did not happen to all local governments, this study seek to identify factors that contribute to the probability of splitting. This study utilized a logit regression method to estimate the joint influence of those motivations above to the likelihood of splitting. They proposed four hypotheses motivating the establishment of new regions:

- Administrative dispersion: for jurisdictions that may be too large and populations that too dispersed.

³ Darby, Muscatelli and Roy (2005) documented the successful attempts of consolidation of government units in the following countries: Australia, Belgium, Canada, Denmark, Ireland, Norway, Spain, Sweden and United Kingdom.

⁴ The latest incidence was the death of chairman of Regional House of Representative of North Sumatera at the protest supporting the establishment of Tapanuli district as an independent province (Tempo Interaktif, February 3, 2009)

- Preference for homogeneity: people may prefer to live in a more homogenous in terms of ethnicity, language, religion, or even income level
- Fiscal spoils: splitting could bring additional fiscal resources in the form of general transfer, revenue sharing, or locally derived revenues. Particular incentive for splitting is the lump sum allocation in DAU as the existing and new region will each receive the lump sum. As for revenue sharing, the new region's gain from larger share of the revenue comes at the expense of the other region.
- Bureaucratic and political rent seeker: local bureaucrats/vested interests can be benefit directly from the creation of new local governments; especially if there is additional fiscal revenues will accrue to the new administration.

The hypothesized determinants of proliferation from this study are somewhat similar to the determinants of decentralization, which is understandable since proliferation mostly appears following decentralization reform. The findings support the “dispersion hypothesis” and “homogeneity hypothesis” in public finance; those jurisdictions with greater area are more likely to experience the split while jurisdictions with more homogenous ethnic background are likely to stay together. They also found that wage of government officials are significant to increase likelihood of proliferation after decentralization, which indicates that local bureaucrats may gain prominence with decentralization. However, the results do not support the “fiscal spoil” hypothesis as revenue sharing from natural resources only increase likelihood of split for pre-decentralization events.

Another important research in this area is by Qibthiyyah (2008), who provides a dynamic study on the formation of local governments by exploring how economic and political factors may affect the proliferation decision. This study uses logit and probit estimation method to

examine the likelihood of jurisdiction split events and panel count regression (negative binomial method) for an evaluation of the number of new local governments created from 1993-2004. The hypotheses tested in this study are somewhat similar to the ones tested by Fitrani et al. (2005), which tested for dispersion, homogeneity, fiscal spoil hypotheses, with addition to the possibility of increase in political bargaining as another factor supporting proliferation.

The findings from Qibthiyyah (2008) give more insight into the determinants of proliferation. The main difference with the results in the previous study by Fitrani et al. (2005) is that Qibthiyyah found evidence supporting the “fiscal spoil” hypothesis, that economic incentives is an important factor for the probability of splitting as well as on the extent of proliferation, but the impact varies from one type of transfer to another. Among all forms of intergovernmental transfers, only DAK (*Dana Alokasi Khusus/ Special Grants*) and tax revenue sharing increase the probability of splitting. As for the duration of split, regions with higher share of tax revenue were likely to be the first to experience split since the beginning of decentralization, however it will take longer for them to experience the second (or next) split.

Qibthiyyah’s results also support the “dispersion hypothesis” as one of the determinant of proliferation with an increase in the likelihood of split for larger numbers of population. However, instead of a linear relationship, the results show an inverse U-shaped relationship between population and number of new local governments. This finding reflects the presence of economies of scale associated with the creation of new local governments, as proliferation would be efficient for jurisdictions up to a certain number of populations and inefficient for regions with much larger population.

Another interesting finding from Qibthiyyah’s study is on how local political competition contributes to the probability of jurisdiction split. The results show that local governments with

lower political competition (i.e., existence of majority political party in the local assembly council) have higher probability of splitting, and that local politicians capitalized on the political gains associated with the creation of a new jurisdiction. For politicians from the ruling party, it is easier to be elected or re-elected in the new jurisdiction (smaller size jurisdiction requires less votes compared to the originating jurisdiction).

The most recent empirical study by Imansyah and Martinez-Vazquez (2009) utilizes a different econometric approach to examine the determinants of proliferation, but the testable hypotheses are very much similar with the previous studies. Instead of examining the probability of split, they seek to explain the number and growth rate of local governments using a panel regression method. The observations covered the number of municipalities in 25 provinces (number of provinces before decentralization, excluding the capital DKI Jakarta) over the year 1999-2006. This study adds to the literature by testing more variables that could be associated to each hypothesis, while also testing for variables related to institutional and policy characteristic of proliferated local governments such as: level of development; history of ethnic violence within the region; and history of civil unrest/separatism movements.

In general, results of this study conform to findings from the previous works. They found that dispersion hypothesis to be valid, that higher population density tends to more fragmentation. Fiscal incentives also proved to be a motive for proliferation, specifically, in the case of transfer involving the lump sum component in the DAU (*Dana Alokasi Umum*/ General purpose grants) and DAK (*Dana Alokasi Khusus*/ Special purpose grant). In line with findings of Fitrani et al. (2005), higher revenue sharing from natural resources does not contribute to proliferation, most likely due to the fact that resource rich regions (such as Aceh, Papua, and Riau) have undergone proliferation processes at the very beginning of decentralization era and

that they do not feel the need for more proliferation in their areas. However, localities with higher share of tax revenue and higher wage expenditure per capita are more likely to be proliferated, which also supports the fiscal incentives hypothesis. Contradictory with the previous findings, Imansyah and Martinez-Vazquez found that the separatism movements and ethnic conflicts do not necessarily increase local demand for proliferation.

To conclude the literature review on determinants of proliferation in Indonesia, Table 3 presents the compilation of findings in the three previous studies.

Table 3. Determinants of proliferation in Indonesia

Hypotheses	Imansyah, Martinez-Vazquez (2009)		Qibthiyyah (2008)		Fitriani, Hofman, Kaiser (2005)	
	# of municipal	Growth # municipal	Prob. to split	# of municipal	Pre-decent. prob. to split	Post-decent. prob. to split
Dispersion						
1. Population	+	-		+	N/S	+/-
2. Population squared				-		
3. Area	+	+			+	+
4. Density	-	N/S				
5. # of provincial split	N/S	N/S				
Fiscal incentives						
1. DAU/capita	+	-	N/S			
2. Median share of DAU				+		
3. Natural resource revenue share/ capita	-	N/S	+		+	-
4. Tax revenue share/ capita	+	-	N/S			
5. DAK/ capita	+	N/S	+			
6. Wage expenditure/ capita	+	-			+	+
Homogeneity & civil society						
1. Ethnic fractionalization index (diversity)				+		N/S

Table 3. Determinants of proliferation in Indonesia (continued)

Hypotheses	Imansyah, Martinez-Vazquez (2009)		Qibthiyyah (2008)		Fitriani, Hofman, Kaiser (2005)	
	# of municipal	Growth # municipal	Prob. to split	# of municipal	Pre-decent. prob. to split	Post-decent. prob. to split
2. Ethnic clustering (homogeneity)					N/S	
3. Dummy separatism (for Aceh and Papua)	N/S	N/S		+		
4. Dummy ethnic conflict	-	N/S				
5. Number of active NGOs				N/S		
Stage of development						
1. GDRP/ capita	N/S	N/S		N/S		
2. Development expenditure/ capita						-
3. Household expenditure distribution				-		
4. % population with secondary education						+
5. % poor population	N/S	N/S				
Political incentives						
1. Presence of majority party (GOLKAR)					-	-
2. Political competition				-		N/S

Note: N/S not significant

CHAPTER III

LITERATURE REVIEW ON HEALTH AND EDUCATION SECTORS IN DECENTRALIZED SYSTEM

Education and Health System in Indonesia⁵

Education

Education in Indonesia consists of 2 years of kindergarten followed by 6 grades of elementary school and 3 grades each of junior and senior secondary school. After high school, graduates can continue to diploma or other type of higher education including university, for which times to completion depends on the program. Law No. 20/2003 of the National Education System states that every citizen aged 7-15 years must attend basic education, which implies that the government should provide free educational service to all students at the basic education level.

The World Bank reported that the enrollment rates have increased significantly since the 1970s, due to the government's sustained drive to build school across the country. The net primary enrollment rate was 93% for elementary school, 65.2 % for junior secondary school and 41.7% for senior secondary school in 2005. Although the growth rate is impressive, enrollment rate differences among regions are significant. Given the size, development stage, and diversity of the country, enrollment rate varies from the highest rate in Java to the lowest in Papua.

Increases in the number of students receiving education services have not been necessarily followed by improvements in the quality of education services. The report from The World Bank documented that quality of schooling is relatively low due to factors such as low level of teacher qualifications, structure of teacher compensation, teacher attendance rates, large

⁵ This part is largely taken from Indonesia Public Expenditure Review (PER) 2007 and Investing in Indonesian Education: Allocation, Equity and Efficiency of Public Expenditures (The World Bank, 2007)

class size, and low quality of infrastructure. Compared with students from neighboring countries, students in Indonesia fared poorly on mathematics and language standardized test. In general, the education system has not yet been able to produce more students with the skills and knowledge required to work in economic sectors with high growth potential.

Table 4. Nominal education expenditures by level of government and trend of national education expenditures (Trillion Rupiah) 2001-2004

	2001	%	2002	%	2003	%	2004	%
Central	14.1	33.3	14.7	28.7	22.5	34.7	19.4	31.4
Provincial	2.0	4.7	4.0	7.8	3.9	6.1	2.6	4.2
Municipalities	26.2	61.9	32.6	63.5	38.3	59.2	39.8	64.4
Total National Expenditure	42.3	100	51.3	100	64.7	100	61.8	100
Growth national nominal expenditure		21.28		26.12		-4.48		
Education expenditure (% national expenditure)		11.96		15.19		15.96		13.99
Education expenditure (%GDP)		2.51		3.09		3.81		3.42

Source: PER Indonesia 2007 (The World Bank)

Since the 1990s, national expenditure in education has shown an upward trend except during the economic crisis. After decentralization, the education sector became the highest expenditure category in Indonesia, counting for 13.99% of total national public expenditure in 2004. The majority of education expenditures were spent at the sub national level as shown by the Table 2. The largest share of district expenditures is spent on nondiscretionary routine expenditure, which is allocated to personnel spending.

One special feature of public spending on education in Indonesia is the existence of the “20% Mandate,” a stipulation in the Constitution that was passed in 2002. This article mandates that at a minimum, 20% of government budget needs to be allocated for education sector. Later in 2003, it was amended to exclude teachers’ salary from the mandate. This stipulation has since

created debates among bureaucrats, legislators, and the teacher unions since each party has interpreted this mandate differently. To fulfill this mandate without including teachers' salary would put too much strain on the government budget, as salary is one of major components of education expenditure.

The challenge for the education system in the near future is to focus the attention on secondary education, especially at the junior high school level. In 2004, 56% of total education spending was allocated to primary education, while junior and senior secondary allocation has 15% shared each and tertiary education receive 12% of total spending. With the success of reaching almost 100% enrollment rates for primary education, it is time to extend resources to improve junior secondary education to ensure that all children in Indonesia will receive at least 9 years of education.

Health

For many Indonesians, health service is a service they only have limited access to. In most rural areas, the closest place to get health services is the community health center (*Puskesmas*) and integrated health posts (*Posyandu*) for infant/toddler health care services. Just like in many developing countries, there is a shortage in health professionals which also worsen by uneven distribution of personnel. In 2003, Indonesia had the lowest physician density (number of physicians per 100,000 populations) within its ASEAN neighbors. Ratios of nurses and midwives per population are higher than physicians, but the distribution varies greatly among regions.

Indicators and outcomes from the health sector shows that the Indonesian health sector is well below other countries in the region. Indonesia still compares poorly with its neighbors on

most conventional health outputs such as life expectancy, under 5 mortality rate, maternal mortality rate, and immunization rate. On the other hand, the infant and child mortality rate shows improvement over the time. The infant mortality rate fell from 46 per 1,000 live births in 1997 to 35 per 1,000 live births in 2003.

Indonesia's lack of a social security or insurance system leave the majority of the population with lower income at risk of not getting sufficient, if any, health services. The National Social Survey data (SUSENAS) 2004 shows that household out of pocket fees continue to constitute the majority of total health expenditures. In 2004, Indonesian households contributed to 55% of total health expenditures. In total, about 3.5% of total household expenditures are currently spent on the health sector but this trend is declining since more Indonesians prefer self medication instead of seeing a professional health care. Despite of the effort made to expand the public health care system, access and quality of health care remains low and people rely heavily on private sector provision. More than half of the hospitals belong to the private sector and for the most part they do not provide specialized care services. The World Bank reported that given the relatively low quality of public hospitals, only 45% of sick people, even those with low income, seek health services from public hospitals.

Unlike the education sector, the health sector in Indonesia has relative little importance in government expenditures. In 2001, health expenditures only accounted for 2.6% of total national expenditure and increased to 3.3% in 2004. Table 4 shows that just like education, the majority of health expenditures were spent at the municipal/district level. While the nominal expenditure is lower compared to education expenditure, the growth trend shows that the government has increased the budget allocation to the health sector.

Table 5. Nominal health expenditures per level of government and trend of health expenditure 2001-2004 (Trillion Rupiah)

	2001	%	2002	%	2003	%	2004	%
Central	3.1	33.7	2.9	26.4	5.7	35.6	5.6	31.6
Provincial	1.7	18.5	2.4	21.8	2.8	17.5	4.0	22.6
Municipalities	4.4	47.8	5.7	51.8	7.5	46.9	8.1	45.8
Total National Expenditure	9.2	100	11.0	100	16.0	100	17.7	100
Growth national nominal expenditure		19.56		45.45		10.63		
Health expenditure (% national expenditure)		2.6		3.3		3.9		4.0
Health expenditure (%GDP)		0.5		0.6		0.8		0.8

Source: PER Indonesia 2007 (World Bank 2007)

Overall, The World Bank evaluated the quality of healthcare services in Indonesia as low, with low availability of medication, inadequate infrastructure and often an insufficient supply of healthcare personnel. Given the importance of the health sector to development in general, it is advisable for the government to allocate more resources to the health sector.

Literature Review on Decentralized Education and Health Sectors

Review of International Experience

After more than three decades of decentralization reform worldwide, there exists a vast literature on the architecture of decentralization, technical mechanisms of intergovernmental transfers, and overall relationship between decentralization and economic outcomes such as economic growth (Davoodi and Zou 1998; Zhang and Zou 1998; McNab 2001; Lewis 2005). However, there are fewer studies focused on how decentralization has improved efficiency in public good provision, namely examining the relationship between decentralization reforms and outcomes of public services. This also holds for the case of Indonesia, where majority of

research has focused on the design of intergovernmental transfer system. For the last decade, the main concern of decentralization reform in Indonesia was the distribution of funds from the central to local government through various types of grants.

While many countries devolve or delegate education and health services provision to sub-national governments, there is little evidence that countries which have decentralized their health and education expenditure also have improved the outputs of those sectors. Most of the past studies, done in a qualitative manner, have helped to understand the pros and cons of decentralization, but the magnitude of its impacts on health and education outputs for the most part remained unidentified. When the magnitude is unidentified, it is difficult to measure the cost and benefit of decentralization, which is crucial to the design of sound public policy.

In the case of health sector, studies evaluating the impact of decentralization in developing countries have provided mixed results. The existing literature pointed out that health and decentralization is associated with problems such as increase in regional disparities due to the absence of a mechanism to transfer resources from rich to poor districts. Another major problem in health service is the lack of skilled personnel, lack of information and the loss of economies of scale that counteract the potential efficiency gains from devolution (Robalino, Picazo, and Voetberg 2001). Similarly, West and Wong (1995) also found that decentralization increased regional disparity in provision of health and education services in China.

The widely cited study by Strumpf et al. (1999) is among the first to systematically examine the allocative efficiency changes from provision of public good in a developing country (Uganda).⁶ They collected three years of district level health budget data following the decentralization in Uganda. The data provided extensive details on the allocation decisions made by local government officials and the type of health activities/services undertaken each year. The

⁶ Later updated and published in Journal of Development Studies as Akin, Hutchinson and Strumpf (2005)

results lead to the conclusion that not all was favorable to decentralization; in particular that local government health planner was allocating declining proportions of their budgets to public goods activities.

Another study on a developing country, the Philippines (Schwartz, Guilkey, and Rachelis 2002) used annual audited expenditure data combined by secondary census and demographic survey data for nearly 1600 local government before and after decentralization in the Philippines. The results of this study show that although the local expenditures increased after decentralization, local governments decreased the share of revenue allocated to public health. They also provide strong evidence that public health expenditures at both the province and municipality level have a positive impact on the use of family planning and children vaccination coverage.

Habibi et al. (2003) regressed infant mortality rate as the indicator of human development with two devolution indicators (provincially controlled resources and share of provincial taxes over total provincially controlled resources) using provincial expenditure for Argentina between 1970-1994. The result shows that infant mortality has a significant and negative association with the percent of revenue that is raised locally and with degree of local control over provincial fiscal resources.

In a cross country study using panel of low and high income countries covering the period 1970-1995, Robalino et al. (2001) found that countries where local governments manage a higher share of public expenditures tend to have lower mortality rates. The authors noted that the results should not be interpreted as decentralizing the management of public resources will automatically improve health outputs, but more to support the view that if institutional capacity at the local level is improved then fiscal decentralization is likely to improve health outputs.

Similar result also found by using data set of 52 developed and developing countries from year 1972-1990, where decentralization appears to lower the rate of infant mortality for developed countries on the sample (McNab 2001).

The effect of decentralization to education sector seems similar for developing and developed countries. Faguet (2004) used Bolivian municipalities data before and after decentralization to test whether decentralization make public investment to be more responsive to local needs. The result shows that the pattern of public investment after decentralization differs significantly for several sectors, including education. Investment rises under decentralization where the need of education is greater, which is proxied by higher illiteracy rate. For Colombia, similar shift of public investment towards health and education sector also exists (Faguet and Sanchez 2006).

The productive efficiency from decentralization in these following studies shows positive effects of decentralization on educational outputs. Habibi et al. (2003) used secondary enrollment ratio per 1,000 student in Argentina as the indicator of human development and found that the decentralization measures have positive and significant impact on enrollment ratio. They conclude that decentralization is good for education, that allowing provinces to raise more of their own resources is conducive to improve the educational output.

Faguet and Sanchez (2006) also find positive and significant evidence that decentralization improves public school enrollment in Colombia. Enrollment increases in districts where central government have little say in educational finance and policy making, while decreases in districts with greater control from the central government. They suggest that this was not merely the increasing in financing levels, but due instead to the quality of investment that municipalities achieved – to how and where funds were spent.

For developed countries, Barankay and Lockwood (2007) analyzed the effects of decentralization on the number of students who obtain the university entrance level qualification (*maturité* rate) in Switzerland. Their results show that the degree of decentralization is positively related with educational attainment. Pena (2006) measured the relationship between decentralization in Spain and the survival rate; proportion of students in the last course of ESO (compulsory education) who access to *Bachillerato* (non compulsory education); also shows the positive impact on education outcomes. Result suggests that increase in the survival rate has been mainly motivated by an improvement in government efficiency. Another study on Spain also support the conclusion that decentralization has lead to better adjustment between investment pattern and local need, thus supporting the decentralization theorem (Sole-Olle and Esteller-More 2005).

Review of Health and Education Sector Performance in Indonesia

So far, existing works on decentralization in Indonesia have mainly focused on the design of fiscal decentralization (Alm, Martinez-Vazquez, and Indrawati 2004); how expenditures should be delegated and how intergovernmental transfer should be distributed (Alm, Aten, and Bahl 2001; Silver, Azis, and Schroeder 2001; Brodjonegoro and Martinez-Vazquez 2002; Fane 2003; Sidik and Kadjatmiko 2004). Outside of fiscal architecture, there exists literature on economic outcomes of decentralization such as growth (Balisacan, Pernia, and Asra 2003; McCulloch and Sjahrir 2008), income disparities (Shah and Shankar 2001), or fiscal outcomes (Lewis 2005), but as remarked earlier, there are limited number of studies on the effect of decentralization on social sector such as health and education.

To evaluate decentralized service delivery and governance in the decentralized era in Indonesia, The World Bank performed the Governance and Decentralization Survey (GDS) in 2002 and later updated in 2004 and 2005. This study designed to gauge citizens' perception of quality of service provision through household survey in randomly sampled cities and municipalities. Citizens were asked whether they were satisfied, somewhat satisfied, somewhat unsatisfied or unsatisfied with the various public services and which factors contributed to their perceived satisfaction. The latest GDS2 in 2005 covers 90 cities and municipalities in 26 provinces (Widayanti and Suharyadi 2008).

The results of GDS2 show that 54% of respondents declared that they are satisfied with education service, 32% are somewhat satisfied, 12% are somewhat unsatisfied and only 2% are unsatisfied. Factors associated with increase in satisfaction are: condition of classrooms and school accessibility by road; while factors that lower citizens' satisfaction are student-teacher ratio and percentage of teachers with status as civil servants (perceived as teachers with lower qualifications compared to contract teachers). Meanwhile, factors such as teacher's age, number of student per classroom and hours of instruction improve satisfaction only up to a certain level before becoming factors of dissatisfaction.

For health sector, 58% respondents were satisfied, 32% were somewhat satisfied, 8% were somewhat unsatisfied and 2% were unsatisfied with the quality of service. Factors associated with improvement in satisfaction are: quality of inputs (human resources, medicinal supplies), availability of supporting facilities to the community health center/*Puskesmas* (such as mobile clinics, ancillary clinics), while slower speed of service and longer waiting time contributes to lower respondents' satisfaction. Interestingly, the quality of health infrastructures itself does not determine the satisfaction level.

The result of unlikely high satisfaction for relatively low quality services is a common problem in similar surveys that use “perception” data. First of all, there may be a “courtesy bias” where people may be responding in a polite manner to survey questions without expressing their true sentiments. Second, citizens may have low expectation of public service, thus the current service quality already surpassed their expectation. Lastly, respondents may be relatively inclined to positive outcomes. All these factors may contribute to higher satisfaction level for health and education service, which does not necessarily correspondent to the actual quality of service (Lewis and Pattinasarany 2009; Dasgupta, Narayan, and Skoufias 2009). Therefore, results from GDS and other “score card” type of studies have to be interpreted with caution.

The increasing concern about proliferation in the recent years has expanded literature on decentralization in Indonesia with studies focused on the effects of new government creations. Similar to the literature of decentralization outcomes, the existing research on proliferation also mostly focused on the fiscal outcomes. A study by BAPPENAS & UNDP (2008) found that: fiscal performance of newly created municipalities is lower compared to its originating municipalities; the proliferated localities (newly created and originating ones) have higher fiscal dependency compared to the non proliferated municipalities. Another study uses simulation of opportunity costs associated with creation of new municipalities, which estimated prohibitively high amount of aggregate public investment loss⁷ due to proliferation (Oosterman 2007).

To evaluate service delivery in the proliferated areas, the study by BAPPENAS & UNDP (2008) use measures of inputs in 2001-2005 as a proxy to measure service outcomes. For the education sector, the survey finds that schools in proliferated municipalities have lower capacity

⁷ Oosterman (2007) estimated that foregone public investment in year 2007 to reach Rp. 9.1 trillion (approximately US\$ 910 million). He identified two potential source of this lost: “sticky” routine expenditure effect when originating municipalities’ expenditure do not get adjusted for serving smaller population; and lump sum effect where each municipality will receive less transfer since there are more municipalities to share the transfer with.

and higher student-teacher ratios compared to the non proliferated counterpart. Within the proliferated group itself, schools in newly created districts have lower capacity compared to the originating ones. This conclusion is consistent for all surveyed education levels.

For the health sector, the same study found that the proliferated municipalities experience higher growth rate in number of health facilities compared to the non proliferated ones.

Compared to the originating municipalities, the growth rate of health facilities is lower in the newly created districts. However, the growth rates of medical personnel for proliferated areas are significantly lower compared to the non proliferated ones, which emphasize the unevenness of health workers distribution in Indonesia.

While not exactly designed to evaluate effect of proliferation, Governance and Decentralization Survey (GDS2) in 2006 provides some conclusion on resident satisfaction regarding general service delivery in proliferated areas. GDS2 observes lower actual service quality in proliferated areas, which attributes to lower resident satisfaction compared to non proliferated ones. However, the most comprehensive study to date is by Qibthiyyah (2008), which utilizes dynamic panel regression to analyze the impact of proliferation in two time sequences: first as (all year) post event impact, second as year-by-year (duration) from the event of proliferation. The purpose of doing this analysis with different time spans was to anticipate the possibility that the impact on outcomes would vary with the duration of being proliferated.

The econometrics method used in this study is the Difference-in-Difference (DID) method to isolate the effect of proliferation (the treatment) by analyzing the difference in outcomes for the proliferated municipalities (treated group) before and after the treatment compared to outcomes at the same period for the non proliferated group (control group). Data used is panel of municipal health and education outcomes from 1994-2004, which later

distinguished to full sample data and restricted data (only the proliferated municipalities to better understand the impact on newly created versus originating municipality). However, the only health outcome observed was infant mortality rate (IMR) while for education outcomes there are dropout rate, test score, and graduation rate. With this unbalance number of outcomes, the results of this study do not necessarily give general comparison of health versus education service delivery.

For all year post event impact analysis, infant mortality rate in proliferated municipalities is lower than the non proliferated group. For education outcomes, the results show that proliferation affect them negatively. Test score and graduation rate are lower for the proliferated group, with newly created municipalities fare worse than the originating ones. Among all education outcomes examined, only dropout rate improves after proliferation.

The results from year-to-year (duration of being proliferated) analysis are consistent with findings from the full year post event estimation. From the duration analysis, infant mortality rates in newly created municipalities are significantly lower regardless of duration of proliferation. The result also shows that proliferation improved dropout rate in new municipalities, and this improvement started as early in second year after proliferation. Consistent with findings from the full year post event estimation, proliferation does not have positive impact on test scores and graduation rate. Results show that new municipalities have lower graduation rate, regardless of how long they have been proliferated. Meanwhile, new municipalities also have lower test scores, but it is only significant for municipalities that have been proliferated for 3 years.

Since there are only limited literature on service delivery outcomes in Indonesia, there is an urgent need for a more comprehensive examination on the effect of decentralization on health

and education outcomes. Similarly, there is much concern about process and motivation behind creation of new municipalities, but there is lack of empirical analysis to establish whether or not proliferation improves service delivery. This study aimed to fill this gap in the literature by providing evidence on how health and education outcomes change with decentralization and proliferation. Beyond being a test of the increased efficiency associated with decentralization, this study will also provide useful policy implications to improve local government's capacity to deliver public service.

CHAPTER IV

THEORETICAL MODEL

The theoretical model in this study follows the study by Humplick and Moini-Araghi (1996) that analyzes the relationship between decentralization and public service delivery. This study built on the premise that decentralization improves efficiency of service delivery or performance thus improving the outcomes compared to service delivery under centralized regime. With some modifications, the similar approach is appropriate to analyze the changes in measured output of health and education service in Indonesia due to decentralization.

Humplick and Moini-Araghi's (1996) study focused on examining the effects of decentralization on road service delivery, which utilized the extended *double cost* model first developed by Buchanan and Tullock (1962). The application of Laffont and Tirole (1993) model for efficiency of producing goods in a multiproduct framework to the double cost model makes it applicable to the case of providing road services, and also for other public services such as health and education.

Production of health and education services

An agency j , which may be centralized or decentralized, is responsible for providing services to a certain jurisdiction i . The agent produce services generating vector of outputs q , measured in term of quality of service provided. For health and education services, quality is measured by the share of population with access to achieve nationally set health and education policy outcomes.

The agent receives transfer of τ^k from three main sources: central government ($k=1$); user charges ($k=2$); non-users ($k=3$) that contribute in the form of general taxes they pay to central government that may be used to finance the said service. For simplicity, let assume that τ^3 are not measurable since this contribution is not only in tax money but also with externalities they may bear from the service. The agent may choose to combine the following financings options: use all transfer money available; add their own resource to the transfer; or expend some effort to use the transfer money more efficiently. The agency's accountability is then corresponding to the share of each source's contribution to the cost of provision.

In the case of decentralized service provision, the accountability of the agent is related to the local government's contribution to the cost or the degree of decentralization, β , which is defined as follow:

$$\beta = 1 - \frac{\left(\sum_{i=1}^N \tau^1 / N_i \right)}{C_{ij}} = 1 - \left(\bar{\tau}^1 / C_{ij} \right) \quad (1)$$

where $\sum \tau^1$ is the sum of general transfer from the central government, N_i is the number of sub-national government level i , and C_{ij} is the cost of provision of related public service in jurisdiction j . For simplification, C_{ij} will be written as C since in this study we do not differentiate the cost between jurisdiction $j=1, 2, \dots$. Then the degree of decentralization is defined as the average share of government level i to the cost of provision. The decentralization parameter β ranges from 0 for the case of complete centralization to 100 percent where local governments are completely decentralized.

Cost structure

Extending the double cost approach by Buchanan and Tullock (1962), the cost of public service provision distinguishes between resource costs or input costs RC (that is, the costs of provision, administration, and maintenance of infrastructure); and the preference costs $P(q)$ (the costs incurred by health and education service users due to limited availability or low performance of health and education services). In order to maximize welfare from the provision of public service, society seeks to minimize the sum of resource cost and preference cost to produce outputs at quality q .

Resource cost

Consider the first category of costs, the resource costs:

$$RC = C + \Theta \quad (2)$$

Resource costs are comprised of observable, C and unobservable cost Θ . The observable cost C is defined as:

$$C = C(e, q) \quad (3)$$

where observable cost is the total cost of producing health and education services at quality q . In the production process, agent j can use a low ($e = e_l$) or high ($e = e^h$) level of effort for a fixed degree of decentralization β .⁸ Humplick and Moini-Araghi (1996) assume that degree of effort e is not directly observable, but it is greatly determined by efficiency and voter satisfaction objectives. Two agents operating within the same level of decentralization may employ different levels of effort, thus resulting in different performance in terms of resource savings.

⁸ Laffont and Tirole (1993) adopt the term “effort” from the theory of the firms, which is defined as the degree of attention paid by a manager to reduce costs to improve performance.

Let's assume that an agent (such as a local government) receives a general transfer of τ^1 from the central government for producing health and education services. The local government is set to try to meet local preference through expenditure C and degree of effort e . At a lower degree of decentralization, the local government will finance the provision expenses by using all or most of the transfer τ^1 since they have little incentive to be more efficient by extending more effort. On the other hand, local government with a higher degree of fiscal decentralization is closer to the local voters, thus may try to reduce expenditure C by expending more effort e so that the transfer τ^1 can be used for more or other service to meet voter's preference. Agent or local government's costs in expending the effort e can be presented as a disutility of effort:

$$U = \tau^1 - \psi(e) \quad (4a)$$

Using the definition of β in equation (1), then equation (4a) can be rewritten as:

$$U = (1 - \beta) C N_i - \psi(e) \quad (4b)$$

The function $\psi(e)$ represents the cost of effort to an agent or local government, such as the cost of reducing the resource costs RC and the cost of raising more revenue to fulfill voter's demand.

The relationship between the level of effort expended, e , and degree of decentralization, β , is derived from the disutility of effort in equation (4a):

$$\frac{\partial e}{\partial \beta} = \frac{\partial U / \partial \beta}{\partial U / \partial e} \quad (5a)$$

$$\frac{\partial e}{\partial \beta} = \frac{-\beta C N_i}{-\psi} \quad (5b)$$

Since the level of decentralization and the cost functions are positive, equation (5b) will take a positive sign. Then it is presumed that effort is an increasing function of degree of decentralization, such that the local government will put more effort under a decentralized provision of public services of quality q at cost C .

Since effort is a function of decentralization degree, resource costs can be written as:

$$RC(q) = C(\beta, q) + \Theta(e, q) \quad (6)$$

The established literature of decentralization provides some arguments that is useful to explore how cost may vary with the different degrees of decentralization. The literature suggests that central government has the economies of scale due to administrative and technological advantages, which is lost in the inception of decentralization with the increase cost of provision by local government (Buchanan and Tullock 1962; Oates 1972).

Based on these arguments, the relationship between cost and degree of decentralization are assumed to be:

$$\frac{\partial C}{\partial \beta} > 0 \quad \text{if } \beta_L < \beta < \beta^{\max} \quad (7)$$

$$\frac{\partial C}{\partial \beta} < 0 \quad \text{if } \beta^{\max} < \beta < \beta^H \quad (8)$$

where:

β^{\max} = level of decentralization that maximizes resource cost

β_L = minimum level of decentralization or zero decentralization (fully centralized)

β^H = maximum level of decentralization (100 percent decentralized)

Following the diseconomies of scale argument from decentralization, the cost of provision of public service is increasing up to a certain degree of decentralization. However, it is also reasonable to assume that costs increase at decreasing rate with decentralization, especially when the local government has achieved the necessary technological skill to provide the service efficiently. Then, the rate of change of resource cost with respect to different degree of decentralization is:

$$\frac{\partial C^2}{\partial^2 \beta} > 0 \quad \text{if } \beta_L < \beta < \beta^H \quad (9)$$

Preference costs

The second category of cost is the preference costs, which are the costs incurred by local residents due to the mismatch between demand and supply of quality health and education services provided by local governments. Preference costs derived from the social value associated to the outcome q :

$$P(q) = P(\beta, r(e, C)) \quad (10)$$

where $P(q)$ is the perceived value of the quality of health and education service defined as the disutility of lack or low quality of service. The equation (10) shows that the preference cost is determined by the degree of decentralization, as well by the effort e extended in the production of service at cost C written as the transformation function $r(e, C)$.

The relationship between preference costs and degree of decentralization are drawn from the basic arguments of fiscal decentralization. One of the advantages of decentralization is the allocative efficiency argument (Musgrave 1969), which argues that decentralization brings government closer to the people so that they can better answer to local preference.

Decentralization also improves public participation in the decision-making mechanism, thus increasing accountability of local officials. Research shows evidence of better service delivery due to improvement in accountability in decentralized system (Bardhan and Mookherjee, 2006).

Therefore, the relationship between preference cost and decentralization is assumed to be:

$$\frac{\partial P}{\partial \beta} < 0 \quad \text{if } \beta_L < \beta < \beta^{\min} \quad (11)$$

$$\frac{\partial P}{\partial \beta} > 0 \quad \text{if } \beta^{\min} < \beta < \beta^H \quad (12)$$

where:

β^{\min} = level of decentralization that minimize preference cost

β_L = minimum level of decentralization or zero decentralization (fully centralized)

β^H = maximum level of decentralization (100 percent decentralized)

Preference costs decrease with decentralization up to a certain degree, as decentralized local government has better ability to match the local preference. However, as decentralization progresses to the level where the government becomes too fragmented, we may expect that the allocative efficiency gain to be declining as the cost of decision-making increases when the local governments become too small. Therefore, the second derivative of the preference cost with respect to decentralization is:

$$\frac{\partial^2 P}{\partial^2 \beta} > 0 \quad (13)$$

In reality, it is difficult to assess citizen's preference for local public services. Most of the time, individual's preferences will differ from one citizen to another, which make it more difficult to measure community's preference for a certain public service. Therefore, later in this study we will use the measures of local need for public services as the proxy for preferences. Although this proxy is not perfect as needs do not necessarily equal with preference (a community in need of a certain public service may not choose or prefer that local government provide another public service), but in this study we will assume that citizen will prefer to have public services that they needed the most.

The maximization problem

Public service provision in a decentralized system has to take into account the tradeoff between increase in allocative efficiency from the better match to local preference and the loss of economies of scale in production associated with smaller size of government. The optimal solution for this tradeoff is reached when the difference between gains of more efficient provision of public service (due to better match with local preference) and the cost rising from smaller production size is maximized (Oates 1972).⁹

Following Oates' optimal solution, maximization of the social welfare function regarding the provision of health and education services can be written as the difference between the social value of the production of service $V(q)$ and the resource costs to fulfill the demand for service $RC(q)$:

$$W = V(q) - RC(q) \quad (14a)$$

Let assume that the social value of the production of service $V(q)$ is identical with the social value associated with the service $P(q)$. Since the preference cost is defined as the disutility, then $P(q)$ takes a negative sign. Equation (14a) can be rewritten as:

$$W = -P(q) - RC(q) \quad (14b)$$

$$W = -\{P(\beta, r(e, C))\} - \{C(\beta, q) - \Theta(e, q)\} \quad (15)$$

To maximize the social welfare function (15) is equivalent to minimizing the sum of preference costs and resource costs:

$$\max W = \min \{P(\beta, r(e, C))\} + \{C(\beta, q) + \Theta(e, q)\} \quad (16)$$

⁹ This "optimal" solution was achieved under some assumptions, such as government is welfare maximizing and possesses "perfect correspondence" or perfect knowledge of its citizen's taste. These assumptions are restrictive enough for the provision of a single public good, let alone for the production of multiple goods.

Where the first order condition to solve for β^* that maximizes the social welfare function/ minimizes total cost is:

$$\frac{\partial W}{\partial \beta} = \frac{\partial P}{\partial \beta} + \frac{\partial C}{\partial \beta} \quad (17)$$

Considering that decentralization reform in Indonesia has just started less than a decade ago, it is reasonable to assume that at the present decentralization has not arrived at its optimal level. From the condition of resource costs in equation (7), let assume that the present degree of decentralization is at $\beta_L < \beta < \beta^{max}$, such that $\frac{\partial C}{\partial \beta} > 0$. Similarly, from the condition of preference costs in equation (8) let assume that degree of decentralization is at $\beta_L < \beta < \beta^{min}$, such that $\frac{\partial C}{\partial P} < 0$.

The condition to minimize total preference and resources costs in equation (17) is:

$$\left| \frac{\partial P}{\partial \beta} \right| > \left| \frac{\partial C}{\partial \beta} \right| \quad (18)$$

such that the benefit from lower preference cost is greater than the diseconomies of scale from decentralized service provision.

Research shows that health spending in Indonesia seems to be determined mostly by other factors than local needs, so the services and infrastructure available do not fit the local preference.¹⁰ Therefore, condition (18) is plausible for the case of health service in Indonesia where benefits from increased allocative efficiency from decentralization may exceed the diseconomies of scale such that $\frac{\partial W}{\partial \beta} > 0$.

¹⁰ Public Expenditure Review 2007 p. 59 (World Bank 2007)

For education sector, the present decentralization condition in Indonesia may not create diseconomies of scale considering that the size of population in most local governments is quite large.¹¹ Therefore, we may expect that the loss of economies of scale due to smaller size of local government, $\left| \frac{\partial C}{\partial \beta} \right|$, to be small and the benefit from lower preference cost to exceed diseconomies of scale for provision of education services.

As decentralization progresses, the number of local governments are likely to increase over time since citizens would prefer to be closer to their government. This is apparent for the case of Indonesia where number of municipalities nearly doubled since the beginning of decentralization in 2001. While proliferation brings potentially increases in representation and thus improve allocative efficiency by bringing government closer to the people, some observers also suggest that creation of new local government maybe the result of local elite's political ambitions (Fitriani, Hofman, and Kaiser 2005; Qibthiyyah 2008) .

The effect of increasing the number of local governments to social welfare in equation (17) is given by:

$$\frac{\partial W}{\partial N_i} = \frac{\partial W}{\partial \beta} \cdot \frac{\partial \beta}{\partial N_i} \quad (19)$$

From the previous proposition, $\frac{\partial W}{\partial \beta}$ takes a positive sign. The relationship between decentralization and the number (or size) of sub-national government is:

$$\frac{\partial \beta}{\partial N_i} = \sum_{i=1}^N \tau^1 / N_i^2 \cdot C \quad (20)$$

which will also be positive under a certain condition. Therefore, under the following condition:

¹¹ With the population of 221 million people in 2004 (according to MOHA) and about 450 local governments, the average size of population for local governments in Indonesia is about 470,000; which is larger than average size of population for local governments in other countries (e.g., US, European countries).

$$\beta_L < \beta < \beta^{\max}; \beta_L < \beta < \beta^{\min}$$

equation (19) will be positive, such that creation of new local government improves social welfare.

Based on the previous framework, this study is set to test the following hypotheses:

When decentralization is below its optimal level such that $\beta_L < \beta < \beta^{\max}; \beta_L < \beta < \beta^{\min}$, then:

- 1. Decentralization improves health and education service by providing services that better related to local needs.*
- 2. The creation of new local government (proliferation) at the current stage of decentralization improves health and education service delivery.*

CHAPTER V

EMPIRICAL TESTS

This study aims to evaluate the impact of policy changes (fiscal decentralization) in the provision of public goods, as reflected by the outcomes of public expenditure in health and education sector. For this purpose, we use a well established method for policy analysis/program evaluation: the Difference-in-difference (DID) method. This procedure is widely accepted because of its ability to isolate the difference a certain treatment (often in a form of policy implementation or passage of a law) brings, by comparing the before and after outputs for the affected group (the treatment group) to the before and after outputs of the untreated group (known as the control group). DID method builds on several assumptions (Wooldridge 2002), that are:

- Treatment/intervention are random
- Conditional on group fixed effects
- Conditional on time

The first assumption is the strongest of DID. The unbiasedness of DID estimator requires that choice of treatment group does not systematically relate to other factors that affect the outcomes. Simply put, the changes in output over time should have been exactly the same for both groups if there is no intervention. The validity of DID estimation lies on this restrictive assumption; that there is no possible endogeneity of the treatment itself (Bertrand, Duflo, and Mullainathan 2004).

The choice of DID in this study is practical as the necessary assumptions and data requirements are generally fulfilled. First of all, the possibility of endogeneity of the treatment is minimized by the nature of decentralization reform and health and education policy in Indonesia.

Since the reform was launched nationwide in 2001, all local governments in Indonesia were subject to the same policy, eliminating the possibility of non randomness in treatment. Second, the choice of health and education outcomes observed correspond with the outcomes of the National Health and Education policies set by the Central Government, therefore eliminating the endogeneity problem that usually comes with health and education outcomes under decentralized policy (Qibthiyyah 2008). Lastly, since most of the outcome measures are calculated from the annual household survey (SUSENAS), this study will have enough observations to cover periods of pre and post decentralization as called by the DID method.

In the case of Indonesia, as decentralization reform progressed, the number of local governments has increased substantially. This proliferation/creation of new local government process is known in Indonesian language as *pemekaran* (literally: blossoming). Proliferation is observable throughout the country, where the number of local governments in Indonesia has almost doubled within 8 years of decentralization. With this development, any comprehensive evaluation of decentralization impacts has to take proliferation also into consideration. A general examination on decentralized service delivery will not suffice, as it is important also to examine the impact of proliferation in service delivery.

This empirical section is divided into two parts to better answer the following research questions:

- Does decentralization improve service delivery
- Does decentralized local government improve responsiveness to local needs
- Since decentralization resulted in creation of new local governments, how does proliferation policy affect service delivery

Methodology

Evaluation of decentralization on health and education outcomes

This section builds on the work by Faguet (2004), using a modified Difference-in-Difference method to isolate the impact that decentralization has made to the provision of public goods (through public expenditure) and to examine whether or not the changes are determined by indicators of local needs. Our empirical examination will answer the following questions:

- (i) Does decentralization expenditure improve health and education outputs?
- (ii) If the changes are significant, can they be explained by variation in local needs and local institutions?

Following Faguet (2004), the empirical model for each sector is:

$$G_{mt} = \beta_1 \alpha_m + \beta_2 (\alpha_m \times D_t) + \beta_3 \delta_t + \varepsilon_{mt} \quad (21)$$

Where G_{mt} is municipality m measured outcome for each sector of interest for each year, α_m is vector of municipality dummies, δ_t is vector of year dummies, and $(\alpha_m \times D_t)$ is the interaction between municipality dummies and decentralization dummies, which take the values 0 before 2001 and 1 post decentralization, and ε_{mt} is the error term. The empirical model does not exactly follow the standard DID configuration, hence the “modified” DID method. Since decentralization was implemented nationally at the same time (no municipalities were excluded from decentralization), there is no separation between “treated” and “control” group, instead the model focused on evaluation of “before” and “after” implementation of decentralization policy for the same group of municipalities.

In accordance to the assumptions of DID, the empirical model controls for the following:

- Municipality dummy (α_m) which captures all the characteristics of a municipal fixed in time.
- Time dummy (δ_t) which captures year shocks and time specific characteristics.

Meanwhile ($\alpha_m \times D_t$) is the decentralization-interacted municipal effect, which captures municipal specific characteristics that previously did not exist before decentralization. This term will capture the effects of local institutions dynamics that always exist within the community but become more prominent with the reform. Any systematic changes in politics or economy that affect all municipalities in similar ways will be captured by year term δ_t , therefore the term β captures only the effects that are municipality specific.

The variables of interest to analyze the effect of decentralization are the coefficients of municipal dummies and decentralization interacted dummies (β_1 and β_2). Significantly different coefficients support the hypothesis that changes in policy (in this case is implementation of decentralization) contributes to the difference of measured outcomes of health and education sector.

The next tests are necessary to find whether the decentralization induced changes responded to local needs and local institutions. The three tests are:

1. $\beta_1 = \beta_2$ means test. A t -test of whether the means of coefficients of α_m and ($\alpha_m \times D_t$) for each sector are significantly different. Significance suggests that decentralization changed public service provision through the actions of local governments.
2. $\beta_{1m} = \beta_{2m}$ individual tests. This t -test checks whether α_m and ($\alpha_m \times D_t$) are different for each municipality m for a given sector. Significance implies that decentralization changed the local public service provision pattern in a particular municipality. More municipalities

with significant changes give stronger evidence that decentralization changed the public goods provision pattern for the sector of interest.

3. Using the values of β_{1m} and β_{2m} , create new variables β_1 and β_2 , respectively. The last test is to take the *differences* in municipal dummy coefficients on the LHS and estimate the model:

$$\beta_2 - \beta_1 = \xi S_m + \eta Z_m + \sigma D_m + \varepsilon_m \quad (22)$$

for education and health sector, separately. S is a scalar vector of the existing stock of public services at the beginning of decentralization, D is the ratio of own source revenue at initial period, and Z is a vector of institutional variables for each municipality m . With this approach, it is possible to see only the changes in public service due to decentralization and then explore its determinants.

By construction, the dependent variable should only be explained by variables that change with decentralization. Then variables that do not vary between pre reform and post reform such as socio-economic, geographical and other similar factors will be excluded from the regression. Faguet (2004) assumes that stock of public services in each sector of interest, S , and other variables included in Z are constant over the period of study. Although it is less reasonable to assume they are constant, the limited data availability leaves no choice but to assume constant S and Z over time. We will use the initial year's ratio of own source revenue, D , as the third determinant of changes in public service outputs. With other determinants (Z and S) being a scalar, the use of initial D measures will maintain the consistency of data set in the regression.

The main coefficient of interest is ζ , which is interpreted as an indicator of the degree to which expenditure decision response to local need. The type of information used here as indicators of local needs are:

- Penetration rates of public services, r . Examples of r are number of school or medical facility per village. The coefficient of ζ is expected to have negative sign when S_m is measured by the penetration rate r , suggesting that local governments under decentralized regime provide more service to municipalities with less stock of public services.
- Condition/incidence that requires government intervention, k . Example for k is number of epidemics occurred per village. The coefficient for ζ is expected to have a positive sign when S_m is measured by the need indicator k , suggesting that local governments under decentralized regime provide more service to help municipalities in hardship.

The variable Z captured the institutional determinants of expenditure decisions.¹² The coefficient η should explain the effect of institutional and civic pull into decentralized public service delivery decision. Many variables can be included into this category, such as the number of private enterprises, the number of civil/non government organization, information technology, etc. One may argue that in a district where economic activities are mainly conducted by private enterprises; local government will receive more pressure from local business to allocate expenditure in economic and welfare enhancing activities. Similarly, districts with more civil institutions/NGOs will be more likely to be accountable on how public expenditures should be spent.

In addition with the determinants of expenditure used in Faguet's study, we include the ratio of own source revenues to total local government revenues, D_m . This ratio is a widely used

¹² Faguet (2004) found surprising amounts of data available to capture institutional characteristics of local governments in Bolivia, such as: private sector, project planning, civil institutions, training and capacity building, and Information Technology. However, most of these data are not available for Indonesia.

measure of decentralization known as the “revenue decentralization index.” It measures local government dependency to resources transferred from the higher tier governments. In Indonesia, since the largest portion of local government revenue comes from unconditional intergovernmental transfer (*Dana Alokasi Umum* or DAU), it is more likely that local government would receive less pressure from citizens on the use of public funds. Estache and Sinha (1995), Bardhan and Mokherjee (2006) find that decentralization tends to expand service delivery levels when local governments are self-financing and have greater degrees of fiscal autonomy. Then revenue decentralization ratio is expected to have positive effect on changes in government expenditure.

Table 6. Variables contributing to changes in service delivery

Category	Variables
Local needs (S)	
- Service penetration rate	- Number of schools per village
	- Number of health centers, clinics per village
	- Number of medical workers per village
- Disaster/hardship	- Number of epidemics per village
Civic & social institution (Z_1)	
- Civic institution	- Number of villages with LKMD (social & safety board) and LMD (consultative board)
- Social institution	- Number of social foundations per village
Economic (private) sector (Z_2)	
- Private banking/credit union	- Number of credit union per village
	- Number of co-op per village
	- Number of manufacturing industries per village
- Industry	- Number of technical training centers per village
Local government capacity (D)	- Ratio of own source revenue to total revenue

Evaluation of proliferation (pemekaran) on health and education outcomes

While some observers claim that in general proliferation is an undesirable development to decentralization, proliferation has been an inevitable phenomenon in Indonesia. Since the number of municipalities nearly doubled compared to the number before decentralization, any study about the impact of decentralization has to take proliferation into consideration. Proper assessment of the impact of proliferation calls for intensive empirical examination. One way to evaluate the effect of proliferation is to compare the performance of the municipalities before and after being proliferated. The most comprehensive study to date on potential impact of proliferation on public service delivery performance in Indonesia is the study by Qibthiyyah (2008), which also use Difference-in-Difference estimation method.

Following Qibthiyyah (2008), the empirical model for panel data regression for each sector is given by:

$$Y_{i,t} = \alpha_1 + \alpha_2 D^o + \alpha_3 D^n + \sum_T \alpha_4 DT + \alpha_5 (D^n \times \sum D^{nt}) + \alpha_6 (D^o \times \sum D^{ot}) + \sum_k \alpha_7 X_{i,t} + (v_i + \varepsilon_{i,t}) \quad (24)$$

Where t is the estimation period; Y = the measure of outcome; D^o is dummy for the originating/mother district; D^n is dummy for new local governments; DT is the time (year) dummy, $X_{i,t}$ is set of other covariates that may relate to outcome; and the last term is error term. This estimation model controls for the following:

- Group dummies (D^o ; D^n); to control for initial group characteristics
- Time dummy (DT); to control for time trend that may affect outcomes for both groups

Meanwhile,

($D^o \times \sum D^{ot}$) is the post event dummy for the originating local governments

$(D^n \times \Sigma D^n)$ is the post event dummy for the new local governments

The variables of interest to analyze the effect of proliferation are the coefficients of interaction term (α_5 and α_6). Significantly different from zero coefficients support the hypothesis that changes in policy (in this case, the proliferation policy) contributes to the difference of outcomes in proliferated and original local governments.

Control and treatment groups

Ideally, the difference between the treated and control groups is only the treatment itself. In this case, any differences between the two groups were caused only by proliferation and not because of differences in municipal characteristics and preferences. Considering that proliferation occurred in all parts of the country, we will assume that the treatment is random. In this study, treatment group consists of the proliferated municipalities (newly created municipals and the originating municipals), while the control or untreated group consists of municipalities that did not experience proliferation after decentralization. We will refer to this arrangement as the “full sample” analysis. However, we may expect that proliferation will have different effects to the newly created municipalities compared to the originating municipalities. Therefore, the treatment group will be distinguished into two sub-groups, the originating and the newly created municipalities.

In reality, it is observable that proliferation is more prominent in certain regions in Indonesia than others, which brings the possibility of non-randomness in treatment. To deal with this possibility, we will further analyze the effect of proliferation only on the proliferated municipalities, with the newly created municipalities being the treated group and originating

municipalities as the control group. We will refer to this arrangement as the “restricted sample” analysis.

Data

The data used in this study is of Indonesian municipalities, which covers the period of before and after decentralization. The observation period spans from 1994 to 2006, which will vary for each outcome measure due to data availability. The outcome indicators were calculated from the Household Survey (SUSENAS) while measures of local needs and stock of existing public service were calculated from the Village Potential Survey (PODES), both from the Central Bureau of Statistics (BPS). Meanwhile, the revenue decentralization ratio was calculated from budget realization data published by the Ministry of Finance.

Before and after data

While the duration of data available varies for each measure of outcome, the computation process of health and education outcomes for each municipality from before and after decentralization is quite challenging. As decentralization resulted in proliferation, the number of municipalities outside Jakarta increased substantially from 292 prior to decentralization to 434 in 2006. Municipalities were split to create new ones, in some cases even the newly created municipalities have experienced splits themselves. Therefore, the size of jurisdiction of a municipality in 1994 most likely is different in 2006. To make matter more complicated, municipal identification codes used in BPS surveys may not be consistent from year to year.

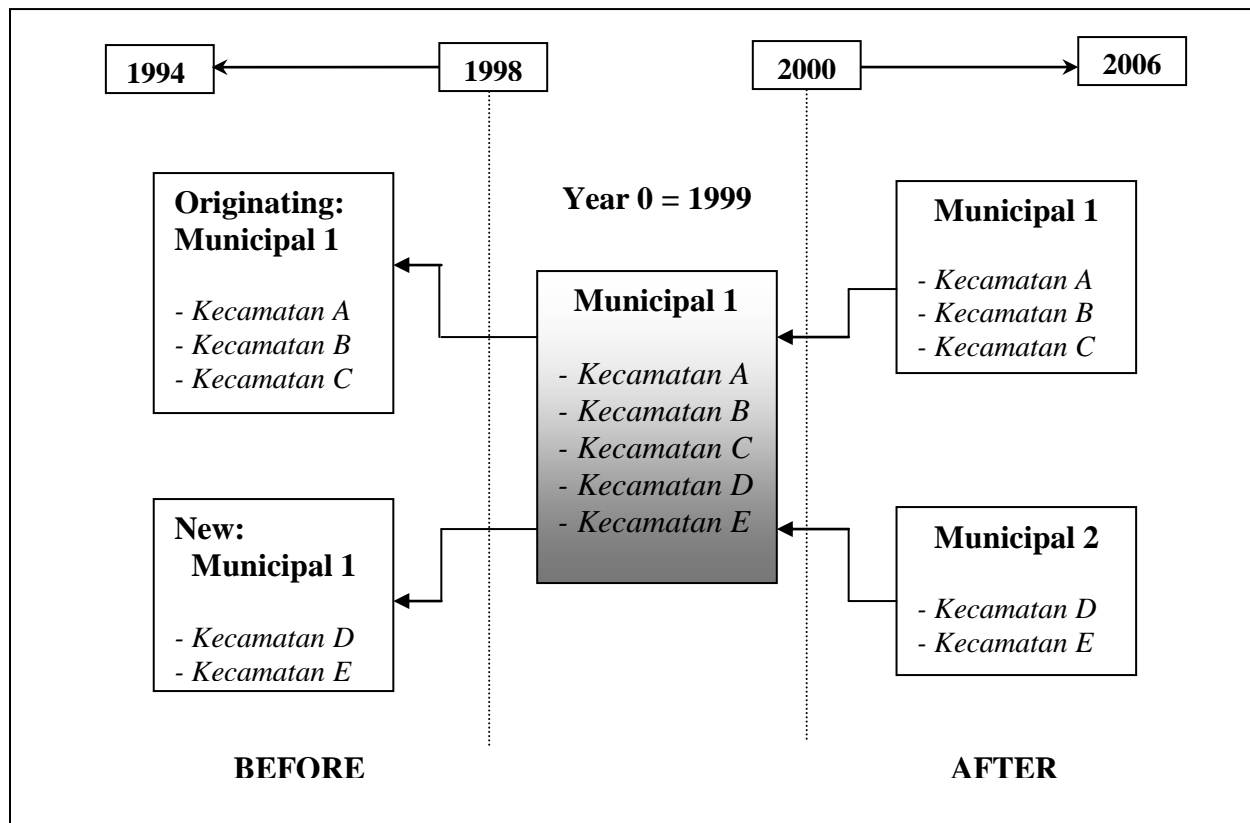


Figure 1. Construction of before and after data

In order to maintain consistency of before and after data, we use municipalities of year 2006 as unit of observation. To reconstruct each of proliferated municipalities to its “before” decentralization entity, we took the following steps:

- Identify the newly created municipalities and the originating municipalities from which they split.
- Identify which sub-districts (*kecamatan*) of originating municipality to become part of the newly created municipality, and which one stayed with the original one. This requires matching the sub-districts in the originating municipality before the split with sub-

districts in the new one (as stated in the Law governing the creation of each new municipality).

- Calculate the “before” outcomes for the new and originating municipalities by extracting observations only from each corresponding sub-districts.

Measuring health and education outcomes

While the task of providing services has been delegated to the sub-national level, the central government is actively setting national standards for important sectors like health and education in order to ensure the quality of service nationwide.

Table 7. National Policy in Health and Education

Sector	National Policy	Expected Outcomes
Education	Mandatory basic education for all citizens starting at the age of 6 years and up – 6 years of elementary school and 3 years of junior high school	<ul style="list-style-type: none"> - Enrollment rate (elementary, junior high, by gender). - Dropout rate (elementary; junior high) - Mean years of schooling - Adult literacy rate (total; by gender)
Health	Pursuant of Millennium Development Goals (MDG): <ol style="list-style-type: none"> 1. Reducing infant and children under 5 mortality 2. Improve maternal health 	<ul style="list-style-type: none"> - Infant mortality (IMR) - Children under 5 mortality (U5MR) - Vaccination coverage rate - Birth attended by trained health workers - Contraceptive prevalence rate

This study focuses on the analysis of the measure of outcomes from the ongoing national health and education programs. By using these uniform indicators, the possibility of regional characteristics bias is eliminated since all regions are subject to the same policy. Table 8 presents the summary statistics for health and education outcomes used in this study. Outcome indicators

are calculated from the Household Survey (SUSENAS) while stock of public goods are calculated from the Village Potential Survey (PODES).

Table 8. Summary statistics of health and education outcomes

Outcomes	Data avail.	Obs.	Mean	Std dev.	Min	Max
Health						
Infant Mortality Rate	1994-2006	4,255	0.043	0.030	0.01	0.30
Under 5 Mortality Rate	1996-2006	4,113	0.035	0.041	0.00	0.40
Life expectancy at birth	1994-2006	3,816	66.861	6.627	28.50	75.10
Labor assisted by medical worker	1994-2006	5,311	61.739	25.224	0.00	100.00
Health service utilization rate	1994-2006	5,320	52.859	17.148	0.00	100.00
Vaccination coverage: DPT	1995-2006*	3,374	40.928	19.919	0.00	100.00
Vaccination coverage: Polio	1995-2006*	3,374	44.658	19.516	0.00	100.00
Contraceptive prevalence rate	1994-2006	5,323	50.847	15.452	0.00	91.81
Education						
Adult literacy rate	1994-2004	4,457	86.076	12.166	15.74	100.00
Adult literacy rate (female)	1994-2004	4,457	81.799	14.135	8.33	100.00
Mean years of schooling	1994-2006	5,323	6.687	0.999	3.68	10.88
Net enrollment rate middle school	1994-2006	5,325	57.155	16.540	0.00	100.00
Net enrollment rate middle school (female)	1994-2006	5,325	57.948	17.746	0.00	100.00
Net enrollment rate high school	1994-2006	5,322	36.654	18.022	0.00	92.04
Net enrollment rate high school (female)	1994-2006	5,318	37.031	18.985	0.00	100.00
Dropout rate primary school	1994-2006	5,323	1.831	1.744	0.00	20.18
Dropout rate middle school	1994-2006	5,312	4.730	5.112	0.00	100.00
Dropout rate high school	1994-2006	5,249	10.901	10.066	0.00	100.00

Note: * vaccination coverage data available from 1994-1999, 2004-2006

Infant mortality rate (IMR), Under 5 Mortality Rate (U5MR), Life Expectancy at Birth

These three outcome measures are among the most commonly used indicators to measure performance of the health sector. The variables required to calculate these three indicators are: number of infants that died before the age of 1 year, number of infants surviving, and number of live births. These household level data are then aggregated to the municipal level and further processed with MORTPAK, software designed by the United Nations to compute mortality and fertility indicators¹³.

The infant mortality rate (IMR) is defined as number of infant deaths per 1000 live births. Figure 2 presents the average annual IMR for proliferated and non proliferated municipalities. On average, IMR rate is lower for non proliferated local governments although the average seems to converge over time. The overall IMR itself shows downward trend, as IMR rate was down from above 50 in the 1994 to below 40 in 2006.

¹³ The method to estimating mortality and fertility from survey data was developed by Brass (1975), which is very useful for countries with limited data on mortality. For Indonesia, the estimation method used is the Trussel variant of Brass estimation, which correspondence to West mortality model of Coale-Demeny regional model life table. For technicality of the calculation, see UN's Manual for Indirect Demographic Estimation (1987).

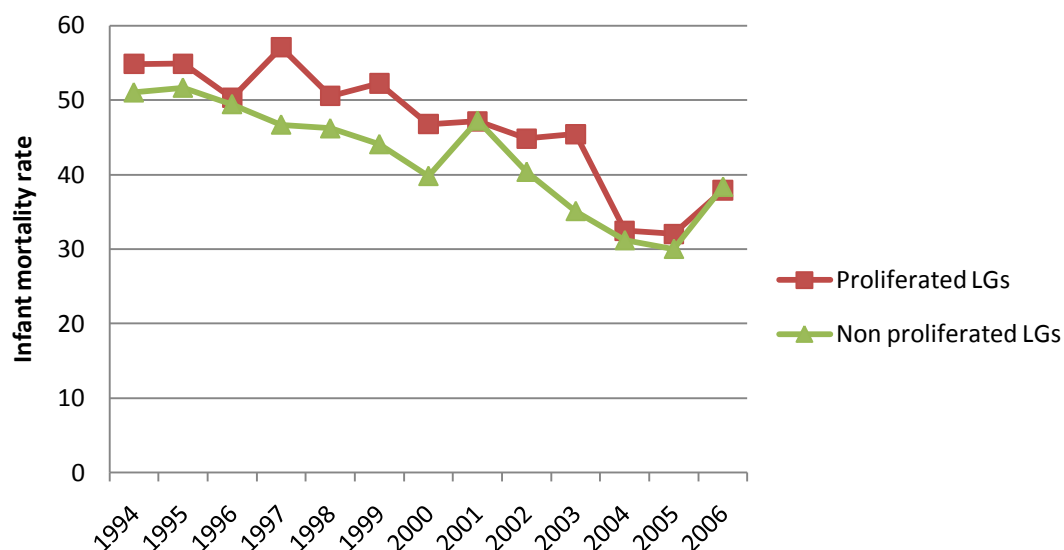


Figure 2. Infant mortality rate

While decentralized health service delivery resulted in lower U5MR for the last few years, the distribution of child care related health services throughout the country still needs improvement. As presented in Figure 3, the proliferated municipalities U5MR on average are higher by 30 deaths than the non proliferated ones, indicating uneven health service distribution within the country.

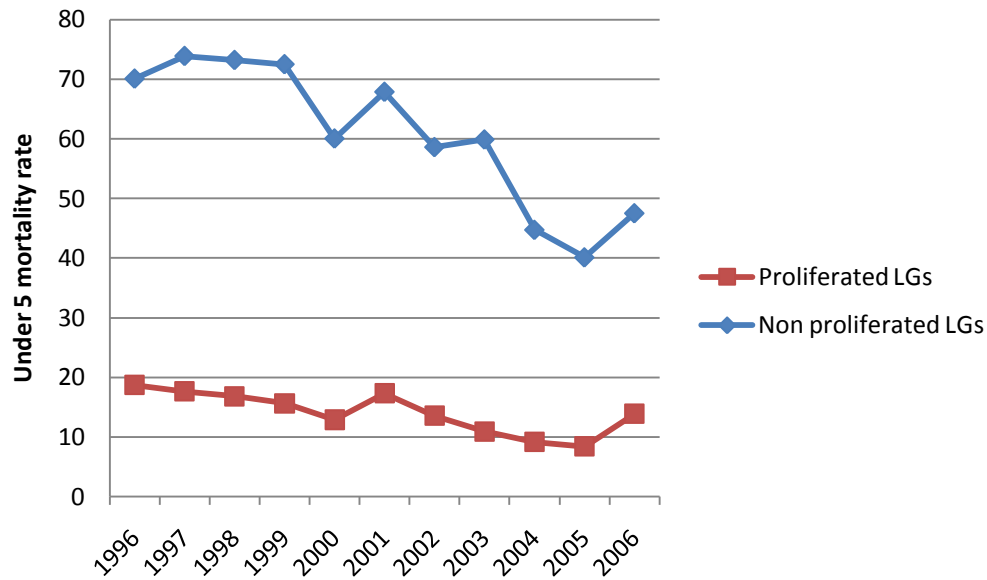


Figure 3. Under 5 mortality rate

Life expectancy at birth is the average years a newborn is expected to live if present mortality rate continues to apply, which reflects the overall mortality level of population. Figure 4 shows increasing improvement in LEAB since 1994. While the pattern is erratic for the proliferated municipalities (both new and originating), the number is consistently improve for the non-proliferated ones. Similar with IMR, the LEAB also converging and in 2006 the number is similar for all groups.

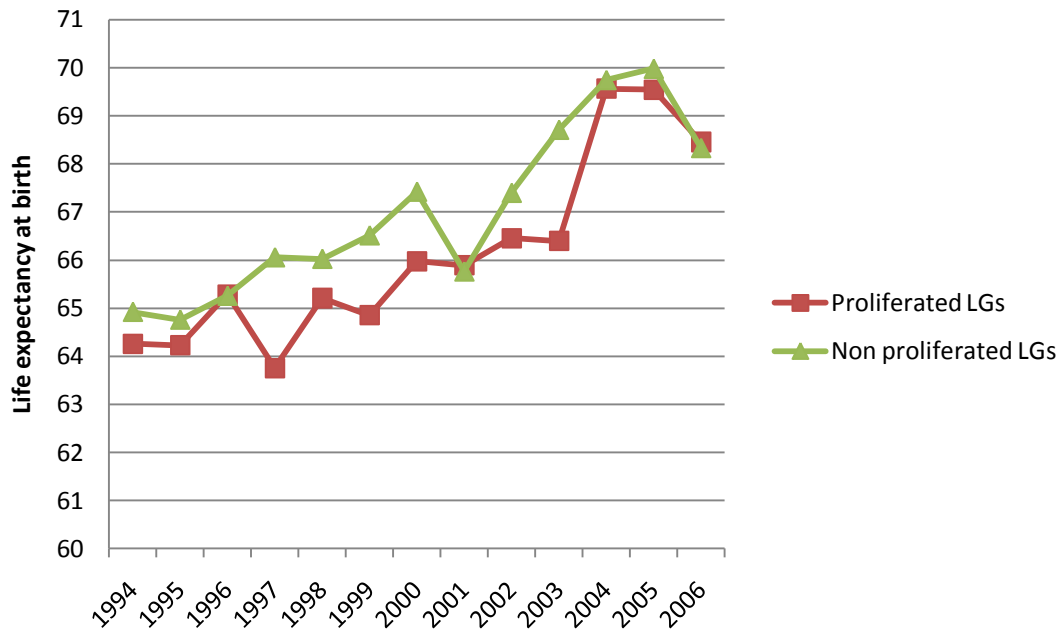


Figure 4. Life expectancy at birth (years)

Vaccination coverage (DPT & Polio)

WHO listed measles vaccination coverage among the outcomes of MDG related health policy, unfortunately data for measles vaccination in Indonesia is very limited. Data obtained from Ministry of Health's Directorate General of Disease Control only have measles vaccination coverage by municipality for year 2001-2004. Given the short period of data availability, it is not feasible to use measles vaccination coverage in this study.

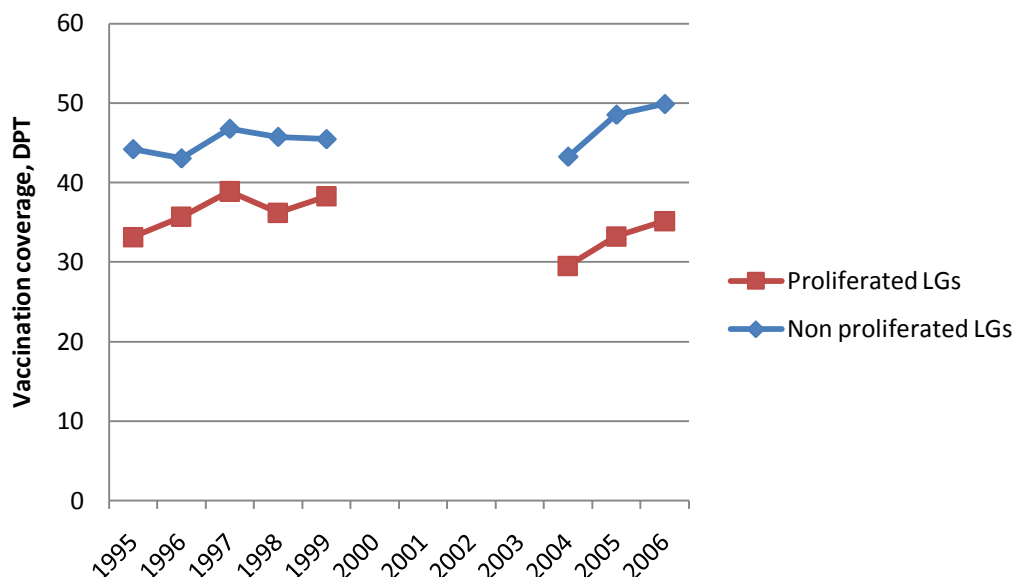


Figure 5. Vaccination coverage, DPT

SUSENAS surveys for coverage of different vaccination programs, but DPT (Diphtheria – Pertussis – Tetanus) and Polio vaccinations are the ones mostly surveyed throughout observation period. Since the Indonesian Pediatric Association strongly recommended vaccination against DPT and Polio for infants (among other necessary vaccines), then it is appropriate to use DPT and Polio vaccination coverage as health outcomes¹⁴.

¹⁴ The Indonesian Pediatric Association timeline for vaccination scheduled for five doses of DPT and Polio vaccines to be completed by age of 5. Therefore, the definition of “DPT and Polio vaccination coverage” in Indonesia should be *the number of children under 5 years with five doses of DPT and Polio vaccines*. This is different with WHO’s definition, where WHO measures coverage as number of children with three doses of vaccines. In this study, we will use WHO’s definition to conform with internationally used health indicator.

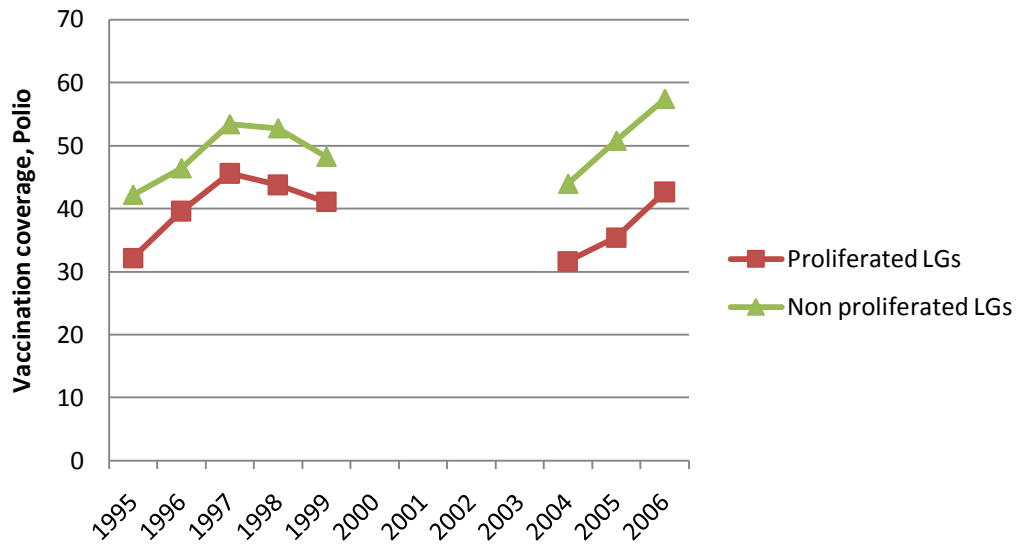


Figure 6. Vaccination coverage, Polio

Health service utilization rate

While it is relatively easy to monitor the number physical health facilities (including personnel) available to general population, the number of health facilities does not necessarily correspondence with the actual utilization rate of health services. This is particularly true for a country like Indonesia with a vast territory and unevenly distributed population which historically has resulted in an unequal (and inefficient) allocation of available health resources (World Bank 2007).

To be able to enjoy health services, a patient has to consider not only the physical distance to existing facilities but also the out of pocket cost incurred in doing so. With no national health plan available and limited participation in private health insurance schemes, out of pocket costs of health service are likely to be the deciding factor for seeking treatment. Improvement in health service utilization rates implies that there are more health facilities available, and most importantly, improvement in accessibility to affordable health services.

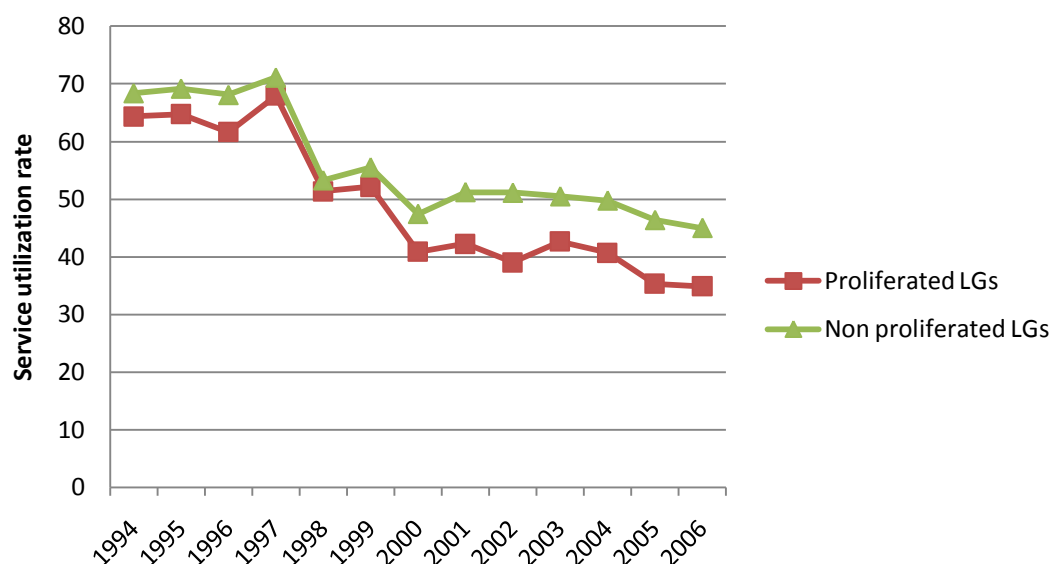


Figure 7. Health service utilization rate

To calculate utilization rate, we use number of people in need of medical treatment (i.e., had health complaints enough to disrupt their daily activities) who seek treatment at hospitals, private clinics, community health clinics (*Puskemas*) or consult with a medical personnel.

Labor assisted by a skilled health worker

Indonesia Demographic and Health Survey (IDHS) 2002 reported a high Mortality Maternity Rate (MMR) of 307 per 100,000 live births. This number apparently has not changed over time and fares poorly compared with other East Asian countries¹⁵. Having a skilled health worker to assist with labor undoubtedly will lower MMR and potentially also lower infant mortality.

¹⁵ World Bank in Public Expenditure Review (2007) even calls Indonesia as a “true regional outlier” regarding MMR, since it is more than 6 times higher than China, 10 and 15 times higher than Thailand and Malaysia.

The role of traditional midwives (*dukun bayi*) to deliver babies is still significant in some regions of Indonesia. While the Government has launched training programs to educate these traditional midwives (*dukun terlatih*), the Household Survey data does not differentiate between labors assisted by trained and untrained *dukun bayi*. Thus the definition of “skilled health workers” used in this study comprises only of doctors, midwives, or paramedics.

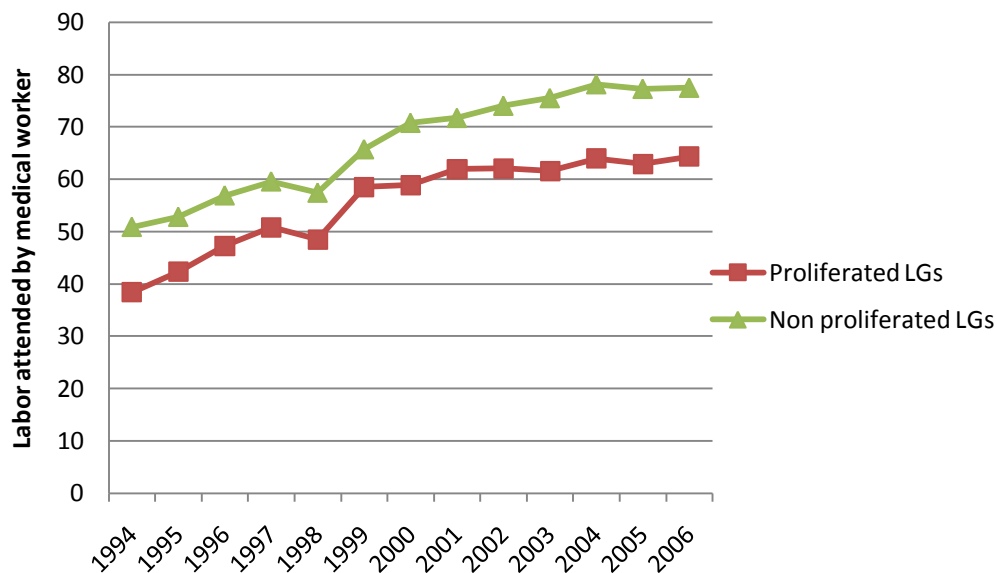


Figure 8. Labor attended by medical worker

Contraceptive prevalence rate

Before decentralization, Indonesia had been acclaimed for its success with the Family Planning program (*Keluarga Berencana*) that in 1989 it received United Nation Population Award. As contraceptive prevalence rate is one of outcomes from MDG, it is only fitting to also use it as a measure of health sector performance.

As shown in Figure 9, in general, the contraceptive prevalence rate shows increasing trend over the period of observation. The non proliferated municipalities experience a sudden

drop from 52% to 48% in year 2001, but continue to increase afterwards. Meanwhile, the proliferated municipalities' prevalence rate shows different pattern with the proliferated ones. The average annual rate for the proliferated increase in the beginning of observation, then decline from 52% to 48% from 1997-2001. This decline was likely due to the relative increase of out of pocket cost of contraceptive after the financial crisis.

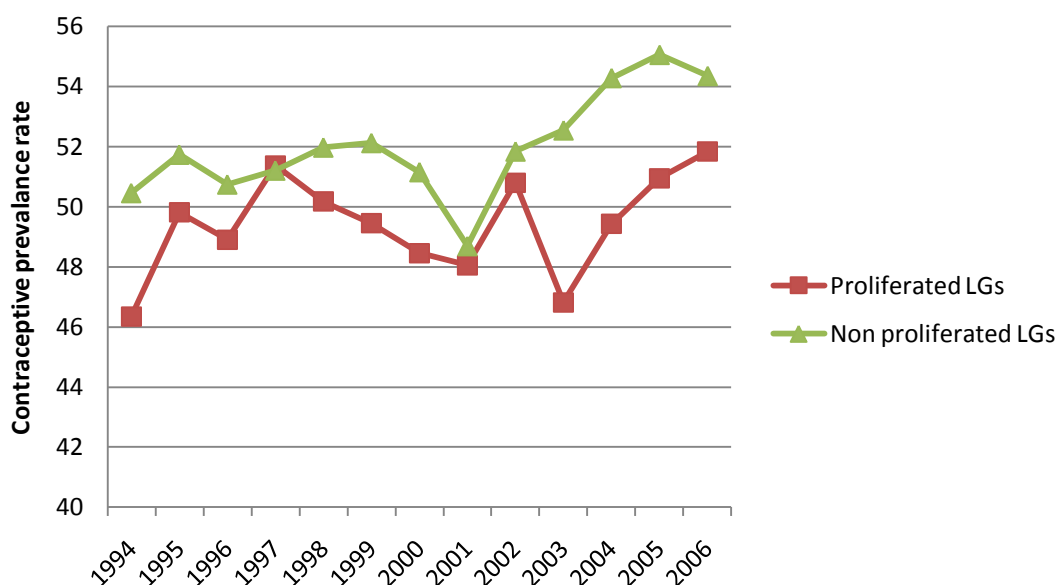


Figure 9. Contraceptive prevalence rate

Adult/Female Literacy Rate

Adult literacy rate is one of the most common indicators used to assess the quality of education services and standard of living in general. The adult literacy rate is defined as the percentages of people aged 15 and older who can, with understanding, both read and write a short, simple statement related to their everyday life. Figure10 shows that adult literacy rate is increasing nationally, with the disparity between proliferated and non proliferated municipalities lessening over time.

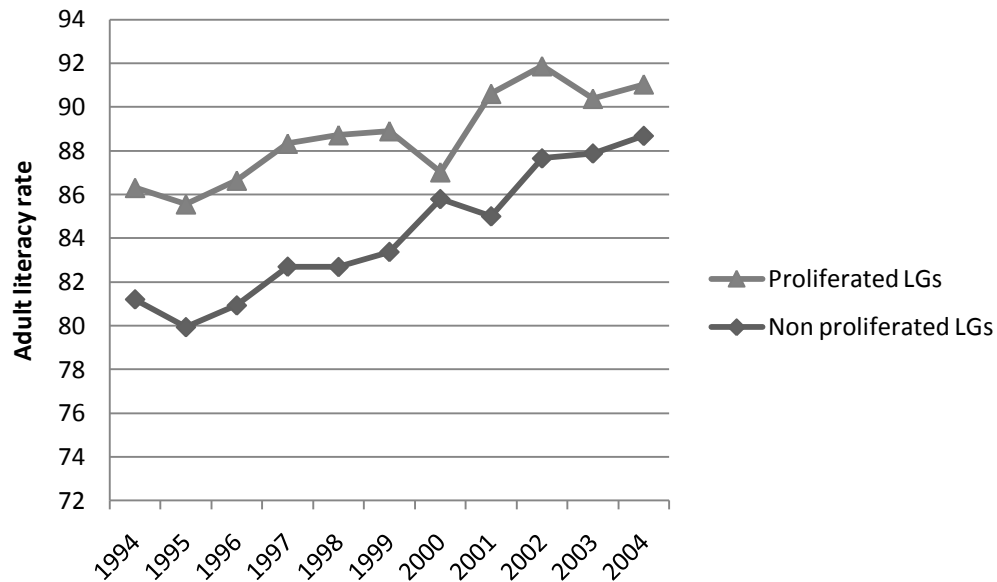


Figure 10. Adult literacy rate

While the overall adult literacy rate shows improvement after decentralization, it is important to find out whether female education also improved with decentralization. The calculated female literacy rates in Figure 11 show that the female literacy rate is slightly lower from the overall rate. By year 2004, the female literacy rate reached 85% and 87% for the proliferated and non proliferated ones, respectively, which is only 4% less than the overall literacy rate for each group. These figures show improvement in education services after decentralization, and more specifically improvement in gender-related equality of education.

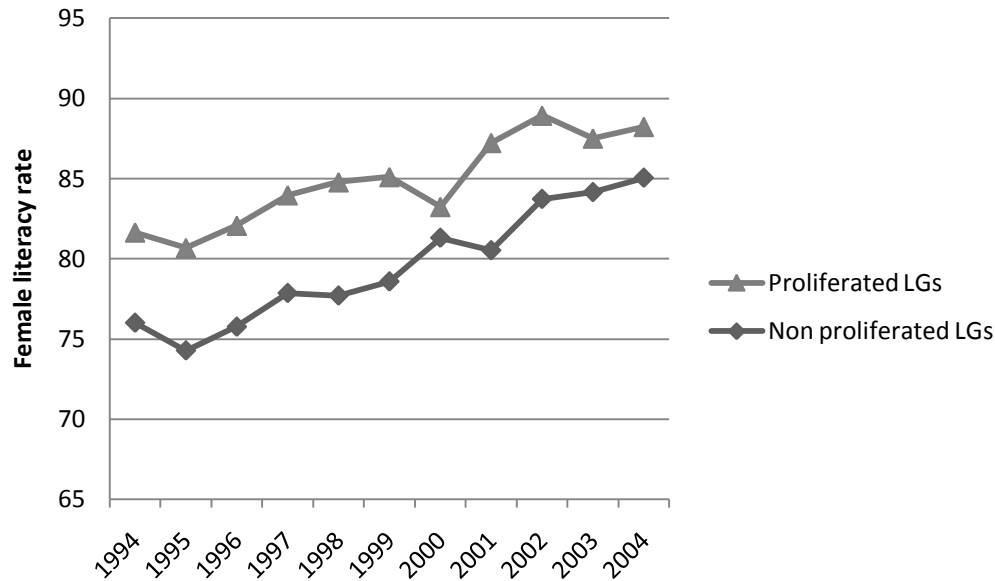


Figure 11. Female adult literacy rate

Net enrollment rate (middle school, high school, overall, female)

National education policy mandates all children age 7-15 years to have 6 years of primary school and 3 years of middle school. Pursuing this national policy has significantly improved enrollment, especially for primary school. The World Bank reported that gross enrollment rate for primary school in 2005 was 107.1% while net enrollment rate reached 93.2% for primary school¹⁶. Given the success in improving enrollment rates for primary education, the challenge to Indonesia education policy is to improve enrolment rates for the next level of education (secondary and tertiary). Therefore, this study will examine the enrollment rate for secondary education (junior and high school) as the education outcomes of interest.

Net enrollment rate for secondary education computes the number of children age 12-15 and 15-17 years who at the time of survey were attending junior and high school, respectively.

¹⁶ As reported in Public Expenditure Review 2007, p. 30

We also examine female net enrollment rates for both education levels, as it is important to find out whether or not there is gender equality in education participation.

Figure 12 presents the net enrollment rate for junior high, while Figure 13 presents the female enrollment rate for junior high school. The enrollment rate shows significant increase from 45% for proliferated and 50% for non proliferated municipalities in 1994 to around 65% in 2006. Unlike other indicators, there is little disparity between the proliferated and non proliferated groups, and at the end of the observation period both groups reached similar enrollment rates. The calculated female net enrollment rate for junior high school is very similar to the overall rate of enrolment, indicating that there is less discrimination in female education.

The net enrollment rate for high school is much lower than that of junior high, which only reached 45% in 2006. Figure 14 reports that at the beginning of observation period, only 25% and 33% of children aged 16-18 enrolled in high school in proliferated and non proliferated municipalities, respectively. The female high school enrollment rate is very similar to the overall number as presented in Figure 15, again indicated that there is improvement in equality of education opportunity for women. The relatively low net enrollment rates presented here show there is immediate need for local governments to extend resources allocated to primary education to provision of the next education level.

We observe convergence in net enrollment rates for junior high school and high school among both groups, as by the end of observation period both proliferated and non proliferated groups reached similar enrollment rates. This indicates that proliferated municipalities put much effort into improving education services delivery to catch up with their non proliferated counterparts.



Figure 12. Junior high school net enrollment rate

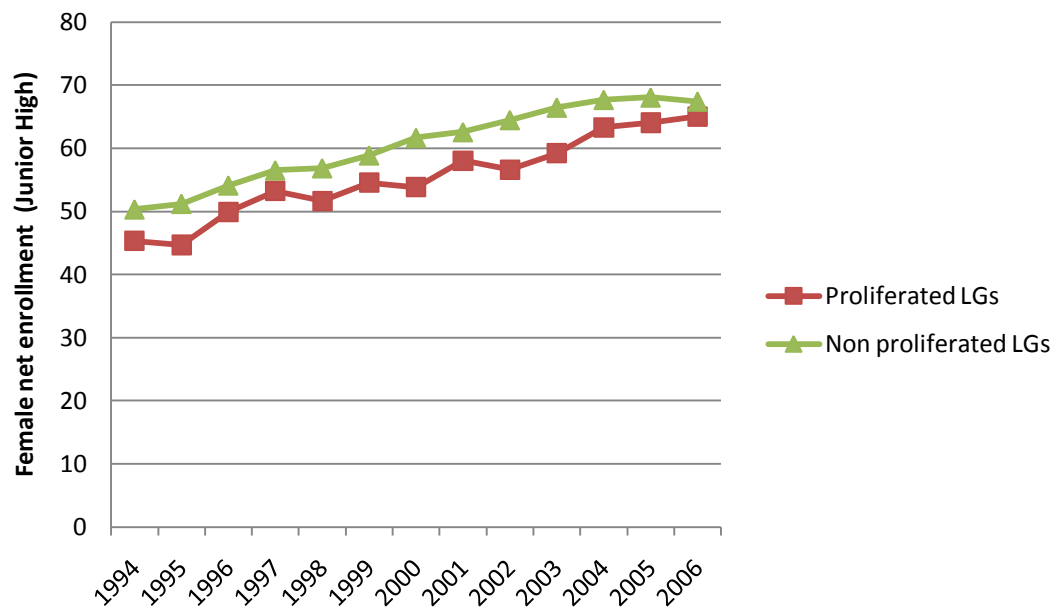


Figure 13. Female net enrollment rate (Junior high school)

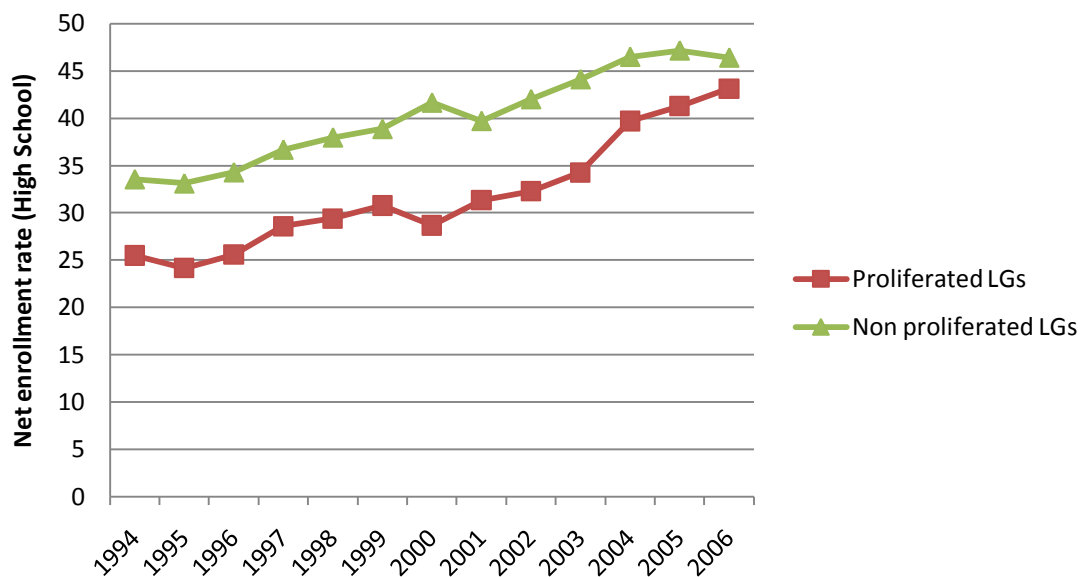


Figure 14. High school net enrollment rate

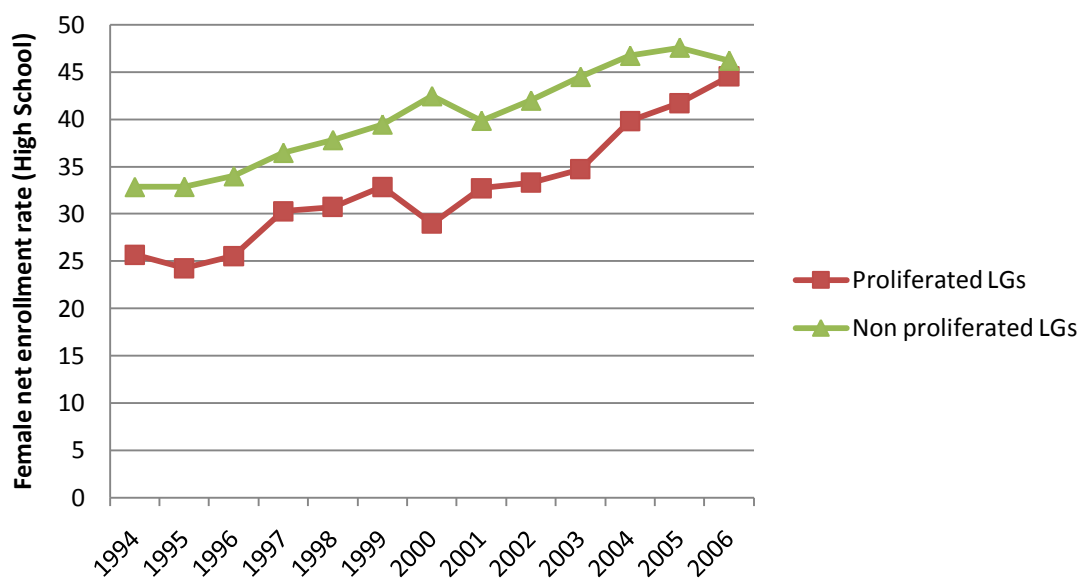


Figure 15. Female net enrollment rate (high school)

Dropout rate (primary, middle, high school)

While enrollment rate shows how many children are enrolled at any level of education, from dropout rate we will find the percentage of children that stay in school during the year of survey. This indicator calculated as the percentage of children at the corresponding school ages that are enrolled but no longer attended school.

Consistent with of mandatory primary education, the dropout rate for primary education is relatively low. Figure 16 shows that dropout rate was less than 2.75% in 1994, which decrease to only 1.5% in 2006. The numbers are relatively similar for proliferated and non proliferated municipalities. Combined with the high enrollment rate for primary education, these figures show the success of pursuing basic (primary) education for children in Indonesia.

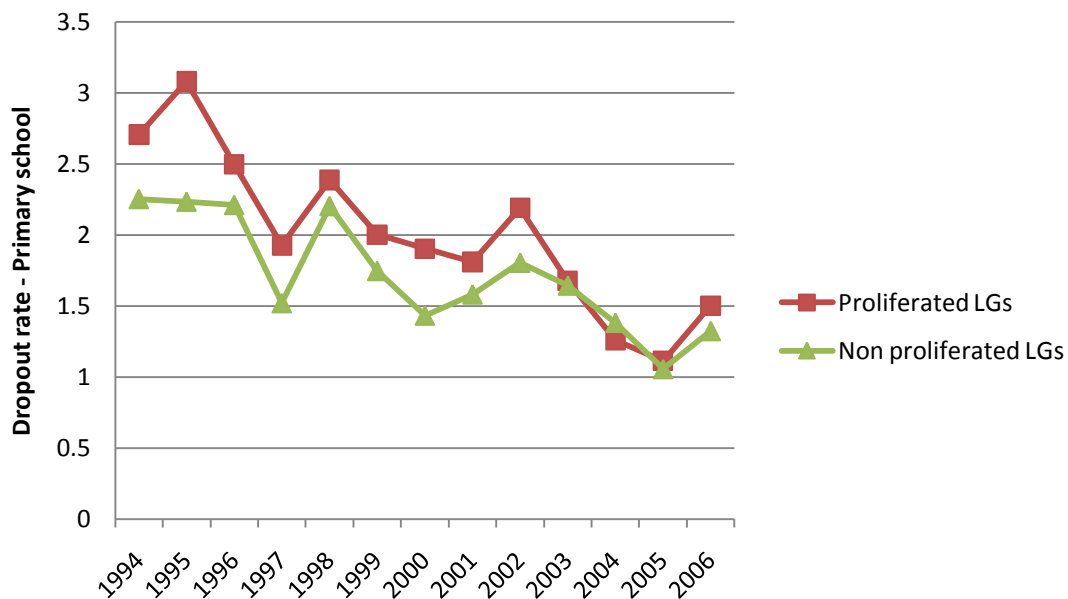


Figure 16. Primary school dropout rate

For junior high school, the dropout rate is significantly higher than that for primary school. Interestingly, Figure 17 shows some unlikely patterns for junior high dropout rate. Following the financial crisis of 1997 and continue to year 2001, dropout rate falls by around 3% for both proliferated and non proliferated municipalities. These changes are unexplainable, as one would expect that dropout rate would increase after the crisis with the increase of out of pocket education costs as well as opportunity cost of children attending school. At the end of observation period, the proliferated municipalities experienced improvement from 6.5% dropout rate in 1994 to 3.5% in 2006, while the proliferated municipalities stay relatively stable with 4% dropout rate over the period.



Figure 17. Junior high school dropout rate

The dropout rates for high school are significantly higher than for the others, which started with 9% for non proliferated and 13% for the proliferated municipalities. Figure 18 also shows that there are unexplained drops starting in 1999 and continuing to year 2001, changes

that somewhat similar to that of junior high school. However, there is no significant improvement in high school dropout rate, as the number fluctuated but ended at about the same rate with 1994. Since data shows that most children in Indonesia have enjoy the 6 years of primary education, the focus need to be shifted to the provision of secondary (junior high and high school) education.

Mean years of schooling

Mean years of schooling is the estimated average of completed schooling for the total population aged 15 or over who has any status of educational attainment. Figure 19 shows that on average people get about 6 years of education even before decentralization, which supports the general recommendation of shifting attention to secondary education. There is a sudden drop for year 2001 that probably better to be treated as an outlier, as there is no logical explanation for this drop. At the end of observation, the average mean years of schooling changes only by 0.5 year for both group. With the implementation of 9 years mandatory education, it is likely that in the next few years the number will improve significantly.



Figure 18. High school dropout rate



Figure 19. Mean years of schooling

CHAPTER VI

EMPIRICAL RESULTS

This chapter presents the results from empirical tests described in the previous section. The first and second set of tests are designed to examine whether decentralization improves health and education outcomes, while the third set of test is designed to explore whether changes in service outcomes are related to measures of local government needs. The last set of test will further answer the question whether or not “advance” in decentralization (local government’s proliferation to create new municipalities) affected the quality/performance of service delivery.

General examination of decentralized health and education outcomes

Table 9 shows the results from the first test, $\beta_1 = \beta_2$ means test. This table reports whether or not means of municipal dummies are significantly different from the means of decentralization interacted dummies for all education outcomes. However, the direction of the change is determined by the value of the post decentralization dummy (β_2). To better explain the effect of decentralization on service outcomes, the result tables will also provide the direction of changes brought by the decentralized regime. Results of the test show that on average most education outcomes change significantly after decentralization. The test indicates significant improvements in national average years of schooling, adult literacy rate, female literacy rate, and lower high school dropout rates.

Table 9. Education outcomes mean test ($\beta_1 = \beta_2$)

Outcome	Coefficient	Mean	Std. error	T-stat	# obs
Adult literacy rate	B1	-8.816	0.503	-16.513***	417
	B2	1.570	0.245		
Female adult literacy rate	B1	-9.867	0.598	-13.986***	417
	B2	0.452	0.276		
Years of schooling	B1	0.286	0.049	3.651***	423
	B2	0.054	0.019		
Net enrolment rate: Middle school	B1	4.345	0.688	8.844***	423
	B2	-3.894	0.405		
Female net enrolment rate: Middle school	B1	7.822	0.726	18.283***	423
	B2	-10.975	0.462		
Net enrolment rate: High school	B1	12.596	0.794	28.792***	423
	B2	-15.804	0.393		
Female net enrolment rate: High school	B1	12.709	0.812	29.424***	423
	B2	-17.333	0.429		
Dropout rate: Primary school	B1	0.619	0.066	2.1247**	423
	B2	0.393	0.049		
Dropout rate: Middle school	B1	0.973	0.172	-0.534	423
	B2	1.133	0.167		
Dropout rate: High school	B1	0.566	0.322	4.111***	422
	B2	-1.989	0.350		

Note: *** statistically significant at 1% ** at 5% * at 10%

For the health sector, the results presented in Table 10 also show significant changes on national health outcomes under decentralized regime. Unfortunately, decentralization brings mixed changes to measured health outcomes. The results show improvement of mortality rates with significant declines in infant, under 5 mortality rates as well as longer life expectancy. But some decentralized health services seem to be less available, as percentage of labor assisted by medical workers, vaccination coverage, and number of active contraceptive users show declining trends.

Table 10. Health outcomes mean test ($\beta_1 = \beta_2$)

Outcomes	Coefficient	Mean	Std. error	T-stat	# obs
Infant mortality rate	B1	0.006	0.001	8.592***	412
	B2	-0.013	0.001		
Under 5 mortality rate	B1	-0.033	0.002	-8.096***	409
	B2	-0.006	0.002		
Life expectancy after birth	B1	-0.875	0.276	-12.224***	407
	B2	4.810	0.238		
Labor assisted by medical workers	B1	26.034	1.060	32.905***	422
	B2	-20.971	0.626		
Service utility rate	B1	24.266	0.469	42.925***	423
	B2	-6.440	0.427		
Vaccination coverage: DPT	B1	19.161	0.727	20.708***	420
	B2	-4.085	0.508		
Vaccination coverage: Polio	B1	12.595	0.689	11.345***	420
	B2	0.230	0.506		
Contraceptive prevalence rate	B1	27.964	0.654	48.639***	423
	B2	-8.063	0.323		

Note: *** statistically significant at 1% ** at 5% * at 10%

The second test is the $\beta_{1m} = \beta_{2m}$ individual test for each municipality. This F -test examines whether α_m and α_m^* are significantly different for each municipality for a given sector. The statistically different result implies that there is significant difference between outcomes in each municipality from before and after decentralization. Similar to the previous test, further investigation is required to find out whether or not decentralization brings favorable changes to health and education service outcomes.

Table 11 presents the number of municipalities experiencing significant change and the direction of change itself. In general, more than 50% municipalities experience significant changes in education outcomes after decentralization. Results show significant improvement for adult literacy rates, dropout rates, and mean years of schooling. However, more municipalities experience declining trend on middle and high school enrollment rate, especially for female

students. These facts emphasize the importance of shifting some of the resources to improve secondary education in order to ensure continuity of education in Indonesia.

Table 11. Test 2: $\beta_{1m} = \beta_{2m}$ municipal test for education sector

Measured outcomes	Significant changes		Direction of change	
	Total	%	% improved	% declined
Net Enrollment Rate Middle School	262	59.28	59.16	40.84
Net Enrollment Rate Middle School (Female)	232	52.49	18.97	81.03
Net Enrollment Rate High School	138	31.22	22.46	77.54
Net Enrollment Rate High School (Female)	155	35.07	18.06	81.94
Adult Literacy Rate	216	52.30	68.98	31.02
Adult Literacy Rate (Female)	220	52.26	54.55	45.45
Dropout Rate (Primary)	380	85.97	18.42	81.58
Dropout Rate (Middle school)	413	93.44	21.07	78.93
Dropout Rate (High school)	408	92.31	59.56	40.44
Mean years of schooling	225	50.90	74.67	25.33

The result for similar test for health outcomes is presented in Table 12. Most municipalities experience significant changes in health outcomes, although the direction of change is not entirely desirable. Similar to the result from the previous mean test, it is also observable that more municipalities experience improvement in mortality related measures, as Under 5 Mortality Rate declines and life expectancy is longer. Aside from mortality-related measures, in general most municipalities only see improvement in contraceptive prevalence rate while more municipalities experience declining health service utilization after decentralization.

Table 12. Test 2: $\beta_{1m} = \beta_{2m}$ individual tests for health outcomes

Measured outcomes	Significant changes		Direction of change	
	Total	%	% improved	% declined
Infant mortality rate	392	88.69	46.43	53.57
Under 5 mortality rate	322	78.73	75.47	24.53
Life expectancy at birth	337	82.80	68.84	31.16
Service utilization rate	126	28.51	19.84	80.16
Labor assisted by medical workers	122	27.60	27.87	72.13
Immunization rate (DPT)	243	57.86	27.16	72.84
Immunization rate (Polio)	306	72.86	34.64	65.36
Contraceptive prevalence rate	56	12.67	46.43	53.57

The third test is to explore the determinants of the difference of municipal dummy variables ($\beta_1 - \beta_2$); that is, what are the factors contributing to changes in health and education outcomes. Decentralization theory posits that decentralized service delivery will better answer local needs, and the next test is to find the relationship between changes in service outcomes to proxy of local needs, pressure from local civic, social and economic institutions, and local governments own fiscal capacity.

Table 13 presents the determinants of changes in education outcomes. Following the proposition in Faguet's study (2004), the negative sign on the impact of service penetration rate implies that decentralized local governments make appropriate decision by allocating more resources to municipalities with less education service (average number of school per village), and less to municipalities that already enjoy higher education service. Although the results are significant only for mean years schooling and high school enrollment rate, they show evidence that education services responded to the variable of local needs.

Other possible contributing factors are the presence of civic and social institutions and economic sector lead by privately-owned enterprises. The results show that civic and social institutions have positive effect on education outcomes, as the presence of village civic

institutions are positively related to higher enrollment rates and lower dropout rates.

Municipalities with more social organization unexpectedly have lower mean years of schooling, which also translated into lower adult literacy rates. The presence of a strong private sector economy in general does not have strong effects to education outcomes, as the results are mostly not significant except for a positive effect on high school enrollment and adult literacy.

Table 13. Determinants of changes in education outcomes (β_1 - β_2)

Determinant	Years school	Adult literacy		Enrollment Mid School		Enrollment High School		Dropout rate		
		All	Female	All	Female	All	Female	Prim	Mid	Hi
Service penetration rate: (average per village)										
Primary school	n/s	n/s	n/s					n/s		
Middle school	n/s	n/s	n/s	n/s	n/s				n/s	
High school	(-)	n/s	n/s			(-)	(-)			n/s
Civic/social institutions:										
Village social & safety board (LKMD)	n/s	n/s	n/s	(+)	n/s	(+)	(+)	(-)	(-)	(-)
Village consultative board (LMD)	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	(-)	n/s
Social/charitable organization	(-)	(-)	(-)	n/s	n/s	n/s	n/s	n/s	n/s	n/s
Economic/ private sector:										
Community credit union	n/s	(+)	(+)	n/s	n/s	n/s	n/s	n/s	n/s	n/s
Cooperative	n/s	n/s	n/s	n/s	n/s	(+)	(+)	n/s	n/s	n/s
Manufacturing industry	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s
Technical education centers	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s
Local fiscal capacity										
Own source revenue share	(+)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)

Note: n/s not significant

Introducing the revenue decentralization ratio as a possible determinant of changes in service delivery proves to have positive and significant effect. As revenue decentralization ratio is an indicator of municipal finances dependency to central government transfer, it is expected that local governments with less dependency on transfers will likely to have more control of their budget decision. The positive sign indicates that decentralization increases education expenditure for municipalities with higher ability to raise their own source revenue, thus resulting in better service provision and better education outcomes. The results show that fiscal capacity is negatively related to changes in education outcomes, that municipality with higher fiscal capacity does not necessarily allocate more resources for education sector. This result should be interpreted carefully; that while local governments with higher fiscal capacity may not increase their resource allocation to education services, they may choose to allocate more resources to other types of public services.

Unlike the education sector, it seems that decentralized resource allocation for health sector does not respond to measures of local needs. As presented in Table 14, the results show that after decentralization, local governments allocate more resources to municipalities that already enjoy higher health services (i.e., have higher average number of health centers and health workers) instead of investing more to municipalities that presently lacking of health services. We also introduced the average number of epidemic occurred within a year as another measure of local needs, but it does not have statistically significant effect to health outcomes.

Similar to the results for the education sector, the presence of civic, social institutions and private sector are positively related to health outcomes. Municipalities with more social organizations have higher service utilization rate, vaccination coverage and contraception usage, while an active private sector economy lead to lower mortality measures. Contradictory with the

case of the education sector, the results show that some health indicators are positively related with fiscal capacity. This indicates that municipalities with higher fiscal capacity increase their health expenditure, thus contributing to improve service provision resulted better health outcomes.

Table 14. Determinants of changes in health outcomes ($\beta_1 - \beta_2$)

Determinant	IMR	U5MR	LEAB	Service Utility	Assisted labor	DPT	Polio	Contra-ceptive
Service penetration rate: (average per village)								
Health center/hospitals	n/s	n/s	n/s	(+)	n/s	n/s	n/s	n/s
Clinics	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s
Doctors	(+)	n/s	n/s	n/s	(-)	n/s	n/s	n/s
Dentists	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s
Paramedics	n/s	n/s	n/s	n/s	(+)	n/s	n/s	n/s
Midwives	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s
Service needs: (average per village)								
Epidemic	n/s	n/s	+	n/s	n/s	n/s	n/s	n/s
Civic/social institutions:								
Village social & safety board (LKMD)	n/s	n/s	n/s	n/s	(+)	n/s	n/s	n/s
Village consultative board (LMD)	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s
Social/charitable organization	n/s	n/s	n/s	n/s	n/s	(-)	(-)	(+)
Economic private sector:								
Community credit union	(-)	(+)	n/s	n/s	n/s	n/s	(-)	n/s
Cooperative	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s
Manufacturing industry	n/s	(+)	n/s	n/s	n/s	n/s	n/s	(+)
Technical education centers	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s
Local fiscal capacity:								
Own source revenue share	(-)	(+)	(-)	n/s	(+)	(-)	(-)	n/s

Note: n/s not significant

Effects of proliferation on health and education outcomes

Over time, decentralization in Indonesia resulted in the creation of a significant number of new local governments. This development is likely to affect local governments' decision on resource allocation, thus it is important to take proliferation into account when examining the outcomes of decentralization. Table 15 reports the impact of proliferation (the coefficients of the interaction term; α_5 and α_6) to service delivery education sector for full sample and restricted sample analysis. Significantly different than zero coefficients support the hypothesis that change in policy (in this case, the proliferation policy) contributes to the difference in education outcomes.

Table 15. Effect of proliferation to education service delivery

Outcome	Full sample		Restricted sample
	New	Originating	New
Mean years of schooling	+	+	n/s
Adult literacy rate	n/s	n/s	n/s
Female adult literacy rate	n/s	n/s	n/s
Net enrolment rate Middle school	+	+	n/s
Net enrolment rate Middle school (Female)	+	+	n/s
Net enrolment rate High school	+	+	n/s
Net enrolment rate High school (Female)	+	+	n/s
Dropout rate: Primary school	-	-	n/s
Dropout rate: Middle school	-	-	n/s
Dropout rate: High school	-	n/s	n/s

Note: n/s not significant

The education sector appears to have highly benefited from proliferation, as the full sample test results show the desirable effect to all education outcomes. Proliferated local

governments have higher enrollment rates, longer years of schooling and lower dropout rates after being proliferated. These results are highly significant and consistent for different estimation methods. It is possible that with creation of new local governments, both new and originating municipalities now managed their education system more efficiently and effectively. Since proliferation brings desirable changes in education outcomes to both new and originating municipalities, it also shows that creation of new local governments does not resulted in redistributing resources away from the originating municipalities.

More specific analysis to the restricted sample group shows that there are no significant differences in effect of proliferation to newly created municipalities compared to the originating ones. The results from restricted sample analysis agree with the results from full sample analysis, where we observe that proliferation affected both newly created and originating municipalities in similar ways.

Table 16. Effect of proliferation to health outcomes

	Full sample		Restricted sample
	New	Originating	New
Infant mortality rate	-	-	-
Under 5 mortality rate	-	-	-
Life expectancy	+	+	+
Labor assisted by medical worker	-	+	-
Service utility rate	-	-	n/s
Vaccination coverage: DPT	-	-	n/s
Vaccination coverage: Polio	-	-	n/s
Contraceptive prevalence rate	n/s	+	-

Note: n/s not significant

On the other hand, health outcomes do not improve significantly for proliferated local governments as shown on Table 16. Mortality related measures experience significant

improvement, as mortality rates decline and life expectancy is longer for both new and originating municipalities while service utilization rate and vaccination coverage are lower for proliferated municipalities. In general, this result provides similar result with the previous tests on general decentralization impact.

The results from restricted sample analysis show similar results to the full sample analysis results. We observe that after being separated from its originating municipalities, newly created municipalities also experience improvement in mortality measures. As for measures of health service utilization (labor assisted by medical workers, contraceptive prevalence rate), the newly created municipalities are worse off after being proliferated.

Complete estimations of health and education performance in proliferated municipalities are presented in Appendix D.

CHAPTER VII

CONCLUSIONS AND POLICY SUGGESTIONS

The purpose of this study is to examine the effect of decentralization reform to health and education service delivery in Indonesia. Previously one of the most centralized countries in the world, Indonesia has moved to be one of the most decentralized one in relatively short period since the beginning of decentralization known as the “Big Bang” in 2001. With decentralization in place, provinces and municipalities demanded more autonomy which resulted in the creation of new jurisdictions. From 26 provinces and 313 municipalities in 1999, the number of jurisdictions grew to 33 provinces with 440 municipalities in 2004.

There exists a substantial amount of literature on Indonesia, which mainly focuses on the fiscal design of decentralization such as expenditure and revenue assignments and also the design of the intergovernmental transfer system. However, after almost a decade since the reform, there is only limited empirical evidence on the relationship between decentralization and outcomes of development sectors. This study aims to fill the gap in the literature by examining whether or not decentralization improved allocative efficiency of government expenditures in the health and education sectors by matching public services with local need and preferences. As decentralization resulted in proliferation, this study also analyzes the effect of local government creation on health and education outcomes.

Education

The results in this study show significant changes in education outcomes under the decentralized regime. In general, more than 50% of municipalities experiencing improvements in

education outcomes, such in literacy rates (overall and female), years of schooling, and dropout rates for primary and secondary education. However, only 46% of municipalities had improvements in enrollment rates for junior high school, while only 33% of municipalities improve their enrollment rate for high school. The numbers for female enrollment rate are even lower, where only 35% improves for junior high and 23% for high school.

Since the beginning of decentralization, the government has launched a “9 years Mandatory Education” program for children aged 6 to 15 to get at least 9 years of education in primary and junior high school. In the past years, the government has successfully improved access to primary education, as enrollment rate for primary education has reached almost 100%. The results of the study indicate that it is time for the government to switch priority to secondary education in order to ensure continuation of education, that by providing accessible secondary education will encourage children to continue schooling once they finished with primary education.

The next exercise explores the determinants of changes in education outcomes, as decentralization is expected to improve allocative efficiency by bringing services that better respond to local needs. The negative sign on the impact of service penetration rate implies that after decentralization, local governments made the appropriate decisions by allocating more resources to municipalities with less education service (lower average number of school per village), and less to municipalities that already enjoy higher education service, thus responded to variable of local needs.

With decentralization, government is expected to become more accountable in response to their citizen increased political participation. Citizen participation may increase in areas with active civic and social institutions, as well as areas with strong economic sector lead by private

enterprises. These factors may influence government decision in allocating resources for service delivery. The result of the exercise show that the presence of village civic institutions positively related to higher enrollment rate and lower dropout rate, although municipalities with more social organization unexpectedly have lower mean years of schooling, which also translated to lower adult literacy rates. The presence of private sector economy in general does not have strong effect to education outcomes, as the results are mostly not significant except for positive effect on high school enrollment and adult literacy.

Other factor that may influence government decision in providing service is their fiscal capacity, that local government with less dependency to transfer have more freedom in allocating their budget. One may expect that local governments with higher own source revenue will allocate their resources to improving important sector such as education, but the result shows otherwise. Fiscal capacity is negatively related to changes in education outcomes; thus, municipalities with higher capacity do not necessarily allocate more resources to the education sector.

Health

Unlike the education sector, decentralization does not bring improvement in health service delivery for most municipalities in Indonesia. There is strong significant improvement for majority of municipalities in mortality related measures such as Under 5 Mortality Rate (U5MR) and life expectancy at birth, but most municipalities experience declining usage of health facilities (physical facilities and personnel). Indicators such as health service utilization rate, labor attended by medical workers, immunization coverage and contraceptive usage are worsen in most municipalities after decentralization. The results are contradictory; since

improvements in mortality-related measures indicate better health care in general but service utilization measures are worsen after decentralization.

One possible explanation for the contradictory results in health service delivery is the uneven distribution of health services. While not all municipalities could build their own hospital, but there should be more community health clinic (*Puskesmas*), ancillary health clinic or mobile clinic available at the municipal level. It is likely that decentralization does not improve the distribution of health services, which people have to travel to the neighboring districts to enjoy health care service. These results express the need of health service reform in Indonesia to improve access to health services.

The uneven distribution of health services is more visible when we examine the determinants of changes in health outcomes. Result shows that after decentralization, the municipalities that already enjoy higher health services (i.e., have higher average number of health centers and health workers) allocate more resources to health sector compared to those municipalities that presently lacking of health services. Another measure of local needs, average number of epidemic occurred within a year, does not have statistically significant effect to health outcomes.

Similar to the results to education sector, the presence of civic, social institutions and private sector are positively related to health outcomes. Municipalities with more social organizations have higher service utilization rate, vaccination coverage and contraception usage, while active private sector economy lead to lower mortality measures. Contradictory with the case of education sector, results show that some health indicators are positively related with fiscal capacity. This indicates that municipalities with higher fiscal capacity increase their health expenditure, thus contributing to better service provision and better health outcomes. However,

this add to unequal distribution in health service, as richer municipalities (i.e., higher own source revenue) will have much better health service than the poorer municipalities while municipalities with lower fiscal capacity (and less health service) will enjoy positive externality provided by their richer neighbors.

Proliferation and service delivery

While there is much debate on pro and contra on the latest proliferation that nearly doubled the number of local governments in Indonesia after decentralization, careful examinations on how proliferation affected service delivery are limited. This study extends the examination of decentralized service delivery by including the proliferation process into consideration.

The results from the examination of proliferation provides similar conclusion with the general effect of decentralization on health and education service delivery. Proliferation seem to benefit education services, as the proliferated local governments (newly created and originating municipalities) experience improvement in enrollment rate, years of schooling and dropout rates. These results are statistically significant and consistent for different estimation methods. More interestingly, education outcomes improved for both new and originating municipalities, thus proving that proliferation are not simply redistributing resources away from originating districts to the newly created ones.

The analysis of health outcomes also resulted in similar conclusions with the previous examination for the overall effects of decentralization. In general, the mortality measures are significantly lower for the proliferated municipalities, and the results are consistent for different estimation methods. However, other health outcomes measures are lower for both originating

and newly created municipalities, which is consistent with the results from general decentralization examination. From this exercise there is also no evidence that proliferation is hurting the originating municipalities, as both new and originating municipalities experience similar changes in outcomes.

Conclusion, policy implications and limitations of the study

After careful empirical examination, decentralization reform in Indonesia does improve education and health service delivery to different degrees. Decentralized government seems to significantly improved education service delivery, which expressed by improvement in most measured education outcomes. Moreover, decentralization also brings service that is better related to local needs and more responsive to local political participation.

Since the government has successfully encouraged mandatory primary education since the beginning of decentralization, now it is time to switch the priority to providing improved secondary education services. The test results show that more municipalities experience lower enrollment rates for junior and high school, and the figures are even lower for female enrollments. If secondary education is more available, more students will have the opportunity to continue education after finishing primary school.

Health service delivery in general also improves with decentralization, which apparent from lower mortality rate and longer life expectancy which indicate overall improvement in health care. However, access to health facilities are not improved with decentralization since the largest proportion of local governments in Indonesia experiencing lower health service utilization rate over time. Results also show that government allocation of resources for health service does not correspondent with indicator of local needs, as municipalities with lower

available health service does not necessarily invest more to improve the quality of service in their localities.

Poor performance of health services, uneven distribution of health facilities and limited access to affordable health services requires immediate attention from the government.

Compared to education, total government expenditure for health services is significantly lower although the service is equally important to improve human resource quality. There is an urgent need for health service reform in Indonesia, which requires not only allocation of more resources, but more importantly significant changes in national health policy.

The empirical study on the performance of proliferated municipalities provides similar conclusions to those obtained in the examination of general decentralization performance.

Proliferated municipalities experience improvement in education outcomes but not so for health outcomes; these results are consistent with the previous examination. Therefore, from the result of this study, there is no evidence to reject proliferation as it does not hurt health and education service delivery outcomes.

It is important to emphasize that proliferation is not necessarily an evil, as proliferation may have resulted in improvements in government efficiency due to greater accountability and improved allocative efficiency associated with smaller size of governments. Without significant sacrifices in economies of scale, thus considering the size of population, area, and diversity of Indonesia, it is possible that proliferation may be necessary in some part of the country. The government needs to regulate the proliferation process and consistently follow through the regulation to ensure that the newly created local governments are qualified to run its own administration.

There are some limitations to this study that will open possibilities for future research in examination of health and education service delivery in Indonesia. First of all, this study will benefit greatly from the analysis of local government expenditures on health and education services, as we will be able to observe whether or not changes in local government expenditures after decentralization/proliferation related to changes in service delivery. However, there was inconsistency in local governments' fiscal reporting format, which made it harder to compare local government expenditures for different municipalities over time. Second, this study ignores the role of central government in health and education service delivery by assuming that central government's role is limited to setting the National Policy in health and education. This assumption is unrealistic, because in reality central government still play important roles in financing and providing health and education services. Third, the observation period may be too short, since it has been less than a decade since decentralization reform took place in Indonesia. Some types of health and education services may need more time to improve; or the benefits from decentralized health and education services are not available immediately. For example, we cannot expect for measures like adult literacy rates to improve immediately after decentralization reform in 2001, or health facilities to become more available right after the proliferation. Therefore, it is important to continue the examination of local governments' performance in the future to better assess the impact of decentralization and proliferation to service delivery in Indonesia.

APPENDIX A

OUTCOMES OF HEALTH AND EDUCATION SECTORS

Table A1. Health outcomes calculated from Household Survey (SUSENAS)

Outcome indicator	Definition	Data availability
Infant mortality rate	Number of children age 0-12 months died / 1,000 life birth	1994-2006
Under 5 mortality rate	Number of children age 1-4 years died / number of children age 1-4 years	1996-2006
Life expectancy at birth	Expected number of years of life remaining at birth, assuming that mortality pattern is constant	1994-2006
Labor assisted by medical worker	Number of labor assisted by medical worker (doctor, midwife, paramedics) / number of children age 1-4 years	1994-2006
Health services utilization rate	Number of people in need of medical treatment (i.e., had health complaints enough to disrupt their daily activities) that seek treatment at hospital, private clinic, community health clinic (<i>Puskesmas</i>) or consult with medical personnel / number of people in need of medical treatment	1994-2006
Vaccination coverage (DPT/Polio)	Number of children age 0-3 years with minimum 3 doses of DPT/Polio vaccines / number of children age 0-3 years	1994-1999 2004-2006
Contraceptive prevalence rate	Number of married women age 15-49 years who currently using contraceptive / number of married women age 15-49 years	1994-2006

Table A2. Education outcomes calculated from Household Survey (SUSENAS)

Outcome indicator	Definition	Data availability
(Female) Adult literacy rate	People (female) age 15 and up who can read and write Latin alphabet	1994-2004
Mean years of schooling	Municipal average of years of schooling enjoyed by citizen 15 years and up	1994-2004
Net enrollment rate: middle school (general/female)	Number of children (female) age 13-15 years currently attending school/ number of children (female) age 13-15 years	1994-2006
Net enrollment rate: high school (general/female)	Number of children (female) age 16-18 years currently attending school/ number of children (female) age 16-18 years	1994-2006
Dropout rate: primary school	Number of children age 7-12 years who was enrolled in primary school, but no longer attended school	1994-2006
Dropout rate: middle school	Number of children age 13-15 years who was enrolled in middle school, but no longer attended school	1994-2006
Dropout rate: high school	Number of children age 16-18 years who was enrolled in high school, but no longer attended school	1994-2006

APPENDIX B

INDICATORS OF PENETRATION RATES AND OTHER DETERMINANTS OF HEALTH AND EDUCATION SERVICES

Table B1. Indicators of health service penetration rates and health service needs

Indicator	Definition	Mean	St. dev	Min	Max
Health service penetration					
Number of hospital/ community health centers	Average number of hospital and community health center (<i>Puskemas</i>) per village	0.20	0.36	0.00	2.46
Number of health clinics	Average number of private health clinics per village	2.03	2.665	0.08	21.89
Number of doctors (MD)	Average number of doctors working per village	0.33	0.41	0.00	1.95
Number of dentists	Average number of dentists working per village	0.15	0.27	0.00	1.72
Number of midwives	Average number of midwives working per village	1.77	0.45	0.43	3.00
Number of paramedics	Average number of other trained medical workers per village	0.77	0.41	0.12	2.00
Health service needs					
Number of epidemic	Average number of epidemic occurred in the last year per village	0.62	0.56	0.00	3.77

Source: Author's calculation from Survey of Village Economic Potential Survey (PODES) 1999

Table B2. Indicators of education service penetration rate

Indicator	Definition	Mean	St. dev	Min	Max
Number of primary school	Average number of primary schools per village	2.93	2.11	0.38	16.11
Number of junior high school	Average number of junior high schools per village	0.59	0.66	0.00	5.49
Number of high schools	Average number of high schools per village	0.35	0.53	0.00	4.11

Source: Author's calculation from Survey of Village Economic Potential Survey (PODES) 1999

Table B3. Other determinants of health and education services

Indicator	Definition	Mean	St. dev	Min	Max
Social/community institutions					
Village social & safety board (LKMD)	Presence of Village Social and Safety Board (Yes = 1, No = 0)	0.78	0.31	0.00	1.00
Village consultative board (LMD)	Presence of Village Consultative Board (Yes = 1, No = 0)	0.69	0.29	0.00	1.00
Social/charitable organization	Average number of social/charitable organizations per village	5.34	1.45	0.44	7.64
Economic/banking institutions					
Community credit union	Average number of community credit unions per village	0.10	0.15	0.00	0.98
Cooperative	Average number of cooperatives per village	0.69	0.48	0.02	2.93
Manufacturing industry	Average number of manufacturing industries per village	17.20	25.65	0.00	258.18
Technical education	Average number of technical learning center per village	0.38	0.61	0.00	3.67
Local fiscal capacity					
Own source revenue share	Ratio of own source revenue to total local government revenue	0.07	0.08	0.00	0.59

Source: Author's calculation from Survey of Village Economic Potential Survey (PODES) 1999; Ministry of Finance

APPENDIX C

DETERMINANTS OF CHANGES IN HEALTH AND EDUCATION SERVICE DELIVERY AFTER DECENTRALIZATION

Table C1. List of variables

Outcome	Definition	Outcome	Definition
AdLit	Adult literacy rate	IMR	Infant mortality rate
AdLitP	Female adult literacy rate	U5MR	Under 5 mortality rate
DOPSc	Dropout rate, primary school	LEAB	Life expectancy at birth
DOMSc	Dropout rate, middle school	SURate	Health service utilization rate
DOHSc	Dropout rate, high school	BAtt	Labor attended by medical worker
MYr	Mean years of schooling	DPT	Vaccination coverage, DPT
NERSMA	Net enrollment rate, high school	Pol	Vaccination coverage, Polio
NERSMAP	Female net enrollment rate, high school	KB	Contraceptive prevalence rate
NERSMP	Net enrollment rate, middle school		
NERSMPP	Female net enrollment rate, middle school		
Determinants of changes			
avdbidan	Number of midwives		
avdbpr	Community credit union		
avddokter	Number of doctors		
avddrg	Number of dentists		
avdindolah	Manufacturing industry		
avdklinik	Number of private health clinics		
avdkop	Number of cooperatives		
avdlketr	Technical education		
avdlkmd	Village social & safety board (<i>LKMD</i>)		
avdlmd	Village consultative board (<i>LMD</i>)		
avdprmedik	Number of other medical workers		
avdrs	Number of hospitals and community health centers		
avdsd	Number of primary schools		
avdslta	Number of high schools		
avdsltp	Number of junior high schools		
avdsosmas	Number of charitable organizations		
avdwabah	Number of epidemics		

Table C2. Determinants of changes in health service delivery after decentralization

Variable	IMR	U5MR	LEAB	SURate	BAtt	DPT	Pol	KB
avdrs	-0.006 (-0.49)	-0.01 (-0.52)	-0.65 (-0.23)	9.76** (2.06)	14.51 (1.47)	-3.15 (-0.40)	3.57 (0.47)	5.79 (1.16)
avdklinik	0.003 (1.25)	-0.00 (-0.63)	0.52 (1.12)	-0.12 (-0.16)	1.66 (1.03)	0.40 (0.32)	0.52 (0.43)	-0.60 (-0.73)
avddokter	0.034* (1.76)	-0.00 (-0.17)	5.74 (1.32)	-4.38 (-0.61)	-38.14** (-2.57)	-4.49 (-0.38)	-9.46 (-0.83)	-9.06 (-1.20)
avddrg	-0.041 (-1.42)	0.03 (0.75)	-6.62 (-1.01)	2.32 (0.21)	-31.65 (-1.40)	-6.78 (-0.38)	-5.76 (-0.33)	4.45 (0.39)
avdprmedik	0.001 (0.10)	0.01 (0.81)	-0.76 (-0.38)	-2.08 (-0.63)	16.60** (2.40)	8.22 (1.51)	4.25 (0.80)	-5.48 (-1.56)
avdbidan	0.006 (1.01)	-0.00 (-0.07)	1.71 (1.19)	0.99 (0.42)	-7.06 (-1.44)	-2.17 (-0.56)	-2.37 (-0.63)	3.34 (1.34)
avdwabah	0.006 (1.63)	-0.00 (-0.45)	1.46* (1.66)	-0.43 (-0.30)	-4.60 (-1.53)	-0.57 (-0.24)	-1.52 (-0.67)	1.35 (0.89)
avdlkmd	-0.004 (-0.34)	0.02 (1.50)	-1.13 (-0.48)	5.86 (1.51)	19.57** (2.42)	6.67 (1.04)	2.26 (0.37)	1.45 (0.35)
avdlmd	0.014 (1.17)	0.01 (0.30)	2.44 (0.92)	1.76 (0.40)	-7.61 (-0.84)	3.66 (0.51)	3.15 (0.45)	-2.71 (-0.59)
avdsosmas	-0.002 (-0.75)	-0.00 (-0.89)	-0.24 (-0.41)	-1.46 (-1.53)	-2.30 (-1.16)	-3.39** (-2.16)	-2.89* (-1.91)	2.50** (2.48)
avdbpr	-0.026* (-1.70)	0.04** (2.06)	-4.19 (-1.22)	-8.43 (-1.48)	-16.33 (-1.38)	10.84 (1.16)	14.95* (1.65)	2.68 (0.45)
avdkop	0.000 (0.06)	-0.01 (-0.89)	-0.18 (-0.10)	2.06 (0.67)	7.20 (1.12)	2.39 (0.47)	3.74 (0.76)	0.61 (0.19)
avdindolah	-0.000 (-1.37)	0.00** (2.29)	-0.02 (-1.21)	0.02 (0.66)	-0.04 (-0.66)	-0.07 (-1.35)	-0.05 (-0.96)	0.06* (1.75)
avdlketr	-0.005 (-0.74)	0.01 (0.75)	-0.92 (-0.55)	-2.53 (-0.90)	6.27 (1.07)	4.96 (1.07)	4.75 (1.06)	4.34 (1.46)
revshare	-0.053** (-2.15)	0.11*** (3.05)	-11.58** (-2.07)	6.62 (0.71)	88.86*** (4.59)	-45.68*** (-3.00)	-44.55*** (-3.02)	2.08 (0.21)
Constant	0.004 (0.25)	0.02 (0.73)	2.36 (0.67)	31.56*** (5.33)	53.49*** (4.34)	-11.90 (-1.22)	1.70 (0.18)	21.01*** (3.36)
Observations	365	365	365	382	381	382	382	382
R-squared	0.07	0.12	0.06	0.04	0.15	0.07	0.07	0.13

Note: * significant at 10%, ** significant at 5%, *** significant at 1%

Table C3. Determinants of changes in education service delivery after decentralization

Variables	AdLit	AdLitP	DOPSc	DOMSc	DOHSc	MYr
avdlkmd	2.81 (1.00)	4.63 (1.37)	-1.70*** (-3.17)	-4.01*** (-2.92)	-8.72*** (-3.06)	0.39 (1.17)
avdlmd	-0.49 (-0.18)	1.12 (0.34)	-0.43 (-0.90)	-2.72** (-2.19)	-1.62 (-0.60)	-0.27 (-0.83)
avdsosmas	-1.19* (-1.78)	-1.34* (-1.66)	-0.01 (-0.09)	-0.18 (-0.57)	-0.16 (-0.25)	-0.16** (-2.00)
avdbpr	17.63*** (4.28)	20.76*** (4.17)	-1.16 (-1.47)	-1.40 (-0.69)	-0.97 (-0.23)	-0.38 (-0.78)
avdkop	-2.95 (-1.35)	-3.34 (-1.26)	-0.69 (-1.63)	0.54 (0.51)	-3.42 (-1.56)	0.39 (1.51)
avdindolah	0.03 (1.27)	0.04 (1.44)	0.00 (1.01)	-0.02 (-1.26)	-0.02 (-0.70)	0.00 (0.15)
avdlketr	-2.11 (-1.14)	-2.23 (-0.99)	0.40 (1.26)	-0.52 (-0.62)	1.51 (0.81)	0.04 (0.19)
revshare	-22.89*** (-3.24)	-28.26*** (-3.32)	-4.00*** (-3.00)	-9.91*** (-2.91)	-13.68* (-1.93)	6.75*** (8.21)
avdsd	0.47 (0.62)	0.54 (0.59)	-0.11 (-1.41)			-0.06 (-0.64)
avdsltp	-3.54 (-1.03)	-4.15 (-1.00)		-0.78 (-1.21)		0.47 (1.14)
avdslta	5.63 (1.34)	6.86 (1.36)			0.65 (0.31)	-0.89* (-1.83)
Constant	15.79*** (4.65)	13.98*** (3.41)	2.81*** (4.49)	7.07*** (4.41)	13.52*** (3.97)	0.49 (1.20)
Observations	379	379	382	382	382	382
R-squared	0.11	0.12	0.17	0.15	0.12	0.17

Note: * significant at 10%, ** significant at 5%, *** significant at 1%

Table C3. Determinants of changes in education service delivery after decentralization (continued)

Variables	NERSMA	NERSMAP	NERSMP	NERSMPP
avdlkmd	13.56*** (2.59)	14.23** (2.57)	11.35** (2.42)	8.41 (1.63)
avdlmd	-3.08 (-0.62)	-5.81 (-1.10)	1.63 (0.38)	1.40 (0.30)
avdsosmas	-1.73 (-1.42)	-1.47 (-1.14)	-1.03 (-0.94)	-0.25 (-0.21)
avdbpr	-2.01 (-0.26)	-4.27 (-0.53)	-3.68 (-0.54)	-6.28 (-0.83)
avdkop	7.17* (1.78)	7.74* (1.82)	4.88 (1.35)	5.26 (1.32)
avdindolah	0.03 (0.65)	0.01 (0.16)	-0.01 (-0.20)	-0.02 (-0.50)
avdlketr	-0.85 (-0.25)	-0.11 (-0.03)	-1.12 (-0.39)	-0.92 (-0.29)
revshare	61.28*** (4.73)	49.36*** (3.60)	54.46*** (4.69)	46.82*** (3.65)
avdsd				
avdsltp			-0.48 (-0.22)	-1.22 (-0.50)
avdslta	-6.94* (-1.80)	-9.09** (-2.23)		
Constant	23.92*** (3.83)	27.23*** (4.12)	-0.83 (-0.15)	8.92 (1.48)
Observations	382	382	382	382
R-squared	0.11	0.08	0.09	0.06

Note: * significant at 10%, ** significant at 5%, *** significant at 1%

APPENDIX D

EFFECTS OF PROLIFERATION ON HEALTH AND EDUCATION SERVICES

Table D1. List of variables

Variable	Definition
dpn	Proliferation-interacted dummy for newly created municipalities
dpo	Proliferation-interacted dummy for newly created municipalities
new06	Dummy for newly created municipalities
ori06	Dummy for originating municipalities
d95-d06	Dummy year (1995-2006)
dnyear0	Dummy for year of split for newly created municipalities
doyear0	Dummy for year of split for originating municipalities
dpr	Dummy for municipalities created by Parliament/ <i>DPR</i> 's initiative
aceh	Dummy for municipalities in Aceh
papua	Dummy for municipalities in Papua

Table D2. Effect of proliferation on health outcomes

Outcome	Full sample						Restricted sample		
	OLS		FE		RE		OLS	FE	RE
	dpn	dpo	Dpn	dpo	dpn	dpo	dpn	dpn	dpn
IMR	-0.01*** (-3.04)	-0.00 (-1.60)	-0.01*** (-3.27)	-0.01*** (-2.90)	-0.01*** (-3.22)	-0.01*** (-2.68)	-0.01*** (-2.85)	-0.00*** (-2.68)	-0.00*** (-2.73)
LEAB	1.06** 2.18	0.58 1.07	0.08 (0.20)	0.60 (1.32)	0.05 (0.11)	0.61 (1.33)	1.09** (2.36)	0.82** (2.03)	0.84** (2.09)
U5MR	-0.02*** -7.60	-0.01*** -4.92	-0.10 (-0.29)	0.24 (0.63)	-0.14 (-0.39)	0.25 (0.64)	-0.02*** (-6.36)	-0.02*** (-6.87)	-0.02*** (-6.96)
SURate	-4.03*** (-4.47)	-4.29*** (-4.99)	-3.35*** (-4.06)	-2.71*** (-3.26)	-3.54*** (-4.38)	-3.11*** (-3.86)	1.25 (1.09)	-0.36 (-0.29)	0.16 (0.14)
BAtt	-3.38** (-2.11)	-3.10** (-2.05)	-3.30*** (-3.29)	2.58** (2.56)	-3.38*** (-3.37)	2.02** (2.02)	-0.00 (-0.00)	-5.20*** (-3.45)	-4.43*** (-3.02)
DPT	-6.92*** (1.66)	-7.88*** (1.62)	-4.52*** (-3.48)	-3.59*** (-3.68)	-4.66*** (-2.85)	-4.07*** (-3.30)	-0.603 (2.008)	-1.48 (-0.74)	-1.50 (-0.80)
Pol	-6.17*** -3.82	-6.85*** -4.39	-3.43*** (-2.64)	-3.32*** (-2.63)	-3.65*** (-2.87)	-3.73*** (-3.02)	-0.48 (-0.24)	-1.07 (-0.53)	-1.07 (-0.57)
KB	0.24 (0.23)	-1.49 (-1.55)	-0.45 (-0.80)	3.19*** (5.61)	-0.42 (-0.75)	2.95*** (5.22)	1.74 (1.43)	-2.72*** (-3.20)	-2.37*** (-2.83)

Note: * significant at 10%, ** significant at 5%, *** significant at 1%

Table D3. Effect of proliferation on education outcomes

Outcome	Full sample						Restricted sample		
	OLS		FE		RE		OLS	FE	RE
	dpn	dpo	dpn	dpo	dpn	dpo	dpn	dpo	dpo
AdLit	-0.79 (0.88)	0.98 (0.91)	0.78* (1.86)	1.07** (2.25)	0.79* (1.92)	0.99** (2.13)	-0.37 (-0.48)	0.40 (0.71)	0.30 (0.55)
AdLitP	-0.301 -0.29	1.37 1.29	-0.02*** (-8.15)	-0.02*** (-6.26)	-0.02*** (-8.27)	-0.02*** (-6.18)	-0.07 (-0.08)	0.35 (0.54)	0.29 (0.46)
MYr	0.06 (0.90)	-0.02 (-0.38)	0.12*** (4.07)	0.17*** (5.72)	0.12*** (3.97)	0.16*** (5.44)	0.09 (1.62)	-0.03 (-0.76)	-0.02 (-0.60)
NERSMP	0.75 (0.74)	1.81* (1.86)	3.03*** (4.46)	3.63*** (5.28)	2.84*** (4.20)	3.43*** (5.04)	0.22 (0.20)	0.98 (0.96)	0.81 (0.82)
NERSMPP	0.22 (0.20)	2.03* (1.92)	2.93*** (3.55)	3.79*** (4.53)	2.62*** (3.21)	3.53*** (4.28)	-0.33 (-0.27)	0.74 (0.59)	0.45 (0.37)
NERSMA	1.21 (1.05)	1.13 (1.03)	4.27*** (6.69)	3.67*** (5.68)	4.10*** (6.44)	3.50*** (5.44)	0.58 (0.47)	1.53 (1.58)	1.36 (1.43)
NERSMAP	0.70 (0.57)	1.11 (0.95)	3.78*** (4.97)	3.91*** (5.08)	3.56*** (4.69)	3.69*** (4.82)	0.18 (0.13)	1.14 (1.01)	0.93 (0.84)
DOPSc	-0.40*** (-3.40)	-0.24** (-2.13)	-0.39*** (-3.57)	-0.45*** (-4.05)	-0.38*** (-3.64)	-0.39*** (-3.68)	-0.22 (-1.52)	-0.07 (-0.44)	-0.11 (-0.76)
DOMSc	-1.40*** (-4.07)	-1.44*** (-4.38)	-1.67*** (-4.58)	-1.11*** (-3.03)	-1.53*** (-4.42)	-1.22*** (-3.56)	-0.46 (-0.94)	-0.87 (-1.45)	-0.69 (-1.31)
DOHSc	-1.36** (-2.00)	-1.03 (-1.61)	-3.27*** (-4.34)	-0.96 (-1.30)	-2.25*** (-3.22)	-0.97 (-1.45)	-0.04 (-0.04)	-1.34 (-1.13)	-0.62 (-0.61)

Note: * significant at 10%, ** significant at 5%, *** significant at 1%

Table D4. Full sample estimates for health outcomes

Variable	IMR		U5MR		LEAB		SURate	
	FE	RE	FE	RE	FE	RE	FE	RE
new06	0.00 (.)	0.00* (1.75)	0.00 (.)	0.05*** (19.38)	0.00 (.)	-0.33 (-0.54)	-1.18 (-1.24)	-3.32*** (-3.95)
ori06	0.00 (.)	0.01*** (3.47)	0.00 (.)	0.06*** (20.56)	0.00 (.)	-2.16*** (-3.44)	0.60 (0.79)	-1.39** (-2.17)
d95	0.00 (1.10)	0.00 (1.08)	0.00 (.)		-1.08 (-1.31)	-1.07 (-1.30)	0.35 (0.50)	0.38 (0.54)
d96	0.00 (0.88)	0.00 (0.87)	0.01** (2.30)	0.01** (2.38)	-0.77 (-0.94)	-0.76 (-0.93)	-1.24* (-1.78)	-1.25* (-1.77)
d97	0.00 (0.91)	0.00 (0.95)	0.01*** (2.98)	0.01*** (3.18)	-0.62 (-0.91)	-0.64 (-0.95)	3.07*** (4.39)	3.07*** (4.35)
d98	-0.00 (-0.19)	-0.00 (-0.08)	0.01*** (2.66)	0.01*** (2.90)	0.08 (0.11)	0.01 (0.02)	-14.48*** (-20.70)	-14.48*** (-20.55)
d99	-0.00 (-0.13)	-0.00 (-0.12)	0.01*** (2.71)	0.01*** (2.82)	0.07 (0.10)	0.06 (0.09)	-12.46*** (-17.51)	-12.39*** (-17.28)
d00	-0.00 (-1.44)	-0.01 (-1.53)	0.00 (.)		1.06 (1.52)	1.09 (1.57)	-21.35*** (-28.34)	-21.30*** (-28.18)
d01	0.00 (0.27)	0.00 (0.11)	0.01*** (3.48)	0.01*** (3.35)	-0.16 (-0.22)	-0.09 (-0.13)	-18.38*** (-25.14)	-18.23*** (-24.92)
d02	-0.00 (-1.10)	-0.00 (-1.25)	0.00 (1.05)	0.00 (0.95)	0.91 (1.30)	0.99 (1.41)	-19.56*** (-26.28)	-19.31*** (-25.85)
d03	-0.01* (-1.68)	-0.01* (-1.82)	0.00 (1.57)	0.00 (1.51)	1.55** (2.17)	1.60** (2.26)	-18.14*** (-24.20)	-17.93*** (-23.87)
d04	-0.01*** (-3.82)	-0.01*** (-3.97)	-0.00 (-1.18)	-0.00 (-1.25)	3.46*** (4.82)	3.51*** (4.92)	-19.48*** (-25.86)	-19.32*** (-25.60)
d05	-0.01*** (-4.20)	-0.01*** (-4.30)	-0.01** (-2.56)	-0.01** (-2.55)	3.67*** (5.12)	3.70*** (5.19)	-23.72*** (-31.47)	-23.45*** (-31.10)
d06	-0.01** (-2.08)	-0.01** (-2.21)	0.00 (0.27)	0.00 (0.28)	0.00 (.)		-24.36*** (-32.32)	-24.21*** (-32.19)
dnyear0	-0.00 (-1.03)	-0.00 (-1.00)	-0.01** (-1.97)	-0.01** (-1.97)	0.50 (0.90)	0.48 (0.87)	-5.09*** (-4.45)	-5.46*** (-4.77)
doyear0	0.00 (0.31)	0.00 (0.51)	-0.00 (-1.10)	-0.00 (-0.81)	-0.18 (-0.27)	-0.29 (-0.44)	-1.65 (-1.28)	-2.26* (-1.76)
dpn	-0.01*** (-3.27)	-0.01*** (-3.22)	-0.02*** (-8.15)	-0.02*** (-8.27)	0.78* (1.86)	0.79* (1.92)	-3.35*** (-4.06)	-3.54*** (-4.38)
dpo	-0.01*** (-2.90)	-0.01*** (-2.68)	-0.02*** (-6.26)	-0.02*** (-6.18)	1.07** (2.25)	0.99** (2.13)	-2.71*** (-3.26)	-3.11*** (-3.86)
dpr	0.00 (.)	0.01* (1.70)	0.00 (.)	0.00 (1.17)	0.00 (.)	-2.06** (-2.31)	0.00 (.)	-3.05** (-2.05)
aceh	0.00 (.)	-0.01** (-1.99)	0.00 (.)	-0.01** (-2.27)	0.00 (.)	1.58 (1.50)	0.00 (.)	5.19*** (2.68)
papua	0.00 (.)	0.00 (1.12)	0.00 (.)	0.00 (0.71)	0.00 (.)	-1.02 (-1.23)	0.00 (.)	5.71*** (3.85)
Constant	0.05*** (16.16)	0.05*** (13.70)	0.04*** (22.86)	0.01*** (6.10)	65.63*** (104.71)	66.20*** (93.04)	66.54*** (119.41)	66.70*** (98.32)
Observations	4,255	4,255	4,113	4,113	3,816	3,816	5,322	5,322
R-squared	0.09		0.09		0.11		0.52	

Table D4. Full sample estimates for health outcomes (continued)

Variable	BAtt		DPT		Pol		KB	
	FE	RE	FE	RE	FE	RE	FE	RE
new06	0.29 (0.25)	-1.19 (-1.07)	2.06 (1.41)	-0.12 (-0.09)	2.65* (1.81)	-0.43 (-0.33)	-1.07 (-1.64)	-1.01 (-1.61)
ori06	-0.22 (-0.23)	-1.63* (-1.86)	-0.44 (-0.36)	-2.42** (-2.32)	1.94 (1.63)	-0.98 (-0.95)	-2.30*** (-4.43)	-2.10*** (-4.19)
d95	2.14** (2.51)	2.15** (2.51)	-4.59*** (-4.92)	-2.84*** (-3.07)	-13.74*** (-14.70)		1.90*** (3.96)	1.91*** (3.96)
d96	6.98*** (8.25)	6.98*** (8.20)	-4.69*** (-5.05)	-2.92*** (-3.16)	-8.56*** (-9.20)	5.20*** (6.24)	1.12** (2.35)	1.12** (2.35)
d97	9.97*** (11.76)	9.97*** (11.70)	-1.18 (-1.28)	0.59 (0.64)	-1.97** (-2.12)	11.79*** (14.16)	2.35*** (4.94)	2.35*** (4.93)
d98	7.09*** (8.38)	7.09*** (8.33)	-3.56*** (-3.84)	-1.78* (-1.93)	-3.73*** (-4.02)	10.03*** (12.05)	2.27*** (4.76)	2.27*** (4.75)
d99	16.18*** (18.78)	16.24*** (18.74)	-2.79*** (-2.94)	-0.91 (-0.97)	-7.56*** (-7.95)	6.34*** (7.27)	1.91*** (3.94)	1.92*** (3.96)
d00	18.71*** (20.50)	18.90*** (20.62)	0.00 (.)		0.00 (.)		-0.60 (-1.18)	-0.54 (-1.06)
d01	19.91*** (22.53)	20.22*** (22.81)	0.00 (.)		0.00 (.)		-2.41*** (-4.85)	-2.38*** (-4.78)
d02	20.47*** (22.73)	20.80*** (23.01)	0.00 (.)		0.00 (.)		-0.68 (-1.35)	-0.61 (-1.21)
d03	22.22*** (24.51)	22.52*** (24.74)	0.00 (.)		0.00 (.)		0.11 (0.21)	0.15 (0.29)
d04	24.73*** (27.13)	25.01*** (27.33)	-6.06*** (-7.35)	-4.08*** (-4.95)	-12.44*** (-15.06)	1.58* (1.69)	1.99*** (3.87)	2.04*** (3.96)
d05	23.42*** (25.70)	23.76*** (25.98)	-2.04** (-2.51)		-7.48*** (-9.21)	6.61*** (7.11)	2.56*** (4.99)	2.64*** (5.13)
d06	24.73*** (27.13)	25.00*** (27.36)	0.00 (.)	2.02** (2.49)	0.00 (.)	14.07*** (15.12)	3.20*** (6.24)	3.25*** (6.34)
dneyear0	-2.78** (-2.02)	-2.91** (-2.10)	-1.42 (-0.60)	-1.86 (-0.79)	0.04 (0.02)	-0.64 (-0.27)	-0.70 (-0.90)	-0.71 (-0.91)
doyear0	1.10 (0.71)	0.53 (0.34)	0.91 (0.37)	0.04 (0.01)	0.78 (0.32)	-0.25 (-0.10)	1.18 (1.34)	1.06 (1.20)
dpn	-3.30*** (-3.29)	-3.38*** (-3.37)	-4.52*** (-3.48)	-4.66*** (-3.68)	-3.43*** (-2.64)	-3.65*** (-2.87)	-0.45 (-0.80)	-0.42 (-0.75)
dpo	2.58** (2.56)	2.02** (2.02)	-3.59*** (-2.85)	-4.07*** (-3.30)	-3.32*** (-2.63)	-3.73*** (-3.02)	3.19*** (5.61)	2.95*** (5.22)
dpr	0.00 (.)	-6.60** (-1.98)	0.00 (.)	-8.38*** (-3.22)	0.00 (.)	-8.81*** (-3.59)	0.00 (.)	-2.85 (-1.28)
aceh	0.00 (.)	4.67 (1.06)	0.00 (.)	-19.86*** (-5.87)	0.00 (.)	-16.81*** (-5.28)	0.00 (.)	-11.11*** (-3.75)
papua	0.00 (.)	-9.87*** (-3.04)	0.00 (.)	-7.55*** (-2.82)	0.00 (.)	-6.83*** (-2.70)	0.00 (.)	-19.07*** (-8.80)
Constant	46.79*** (69.39)	47.07*** (39.38)	44.58*** (55.91)	45.21*** (43.20)	51.33*** (64.25)	40.09*** (41.32)	50.27*** (132.50)	51.12*** (66.46)
Observations	5,313	5,313	3,376	3,376	3,376	3,376	5,325	5,325
R-squared	0.33		0.04		0.15		0.07	

Table D5. Full sample estimates for education outcomes

Variable	AdLit		AdLitP		NERSMP		NERSMPP	
	FE	RE	FE	RE	FE	RE	FE	RE
new06	-2.68*** (-6.26)	-2.14*** (-5.05)	-3.20*** (-6.36)	-2.55*** (-5.13)	-2.16*** (-2.75)	-2.65*** (-3.53)	-1.66* (-1.73)	-2.31*** (-2.59)
ori06	-1.65*** (-4.94)	-1.24*** (-3.78)	-2.04*** (-5.22)	-1.55*** (-4.03)	-2.61*** (-4.14)	-3.14*** (-5.30)	-2.05*** (-2.68)	-2.81*** (-4.00)
d95	-1.19*** (-4.39)	-1.19*** (-4.33)	-1.57*** (-4.94)	-1.57*** (-4.88)	0.17 (0.30)	0.17 (0.29)	0.39 (0.55)	0.38 (0.54)
d96	-0.13 (-0.49)	-0.13 (-0.48)	-0.09 (-0.29)	-0.09 (-0.28)	3.25*** (5.63)	3.26*** (5.61)	4.00*** (5.69)	4.00*** (5.67)
d97	1.58*** (5.85)	1.58*** (5.80)	1.90*** (5.99)	1.90*** (5.95)	6.37*** (11.03)	6.38*** (10.99)	6.71*** (9.56)	6.72*** (9.52)
d98	2.14*** (7.92)	2.14*** (7.86)	2.60*** (8.20)	2.60*** (8.14)	5.44*** (9.43)	5.45*** (9.40)	5.91*** (8.42)	5.92*** (8.39)
d99	2.59*** (9.42)	2.58*** (9.32)	3.22*** (9.99)	3.21*** (9.89)	7.24*** (12.33)	7.27*** (12.33)	8.29*** (11.61)	8.33*** (11.62)
d00	2.46*** (8.44)	2.47*** (8.39)	3.30*** (9.65)	3.31*** (9.59)	7.91*** (12.72)	8.05*** (12.92)	8.91*** (11.78)	9.11*** (12.03)
d01	2.96*** (10.40)	2.94*** (10.28)	3.77*** (11.31)	3.75*** (11.19)	9.31*** (15.44)	9.47*** (15.69)	10.70*** (14.58)	10.92*** (14.88)
d02	4.24*** (14.66)	4.25*** (14.57)	5.51*** (16.25)	5.52*** (16.14)	9.26*** (15.07)	9.47*** (15.37)	10.05*** (13.45)	10.35*** (13.83)
d03	4.33*** (14.75)	4.33*** (14.64)	5.79*** (16.84)	5.80*** (16.71)	11.45*** (18.52)	11.66*** (18.83)	12.56*** (16.71)	12.87*** (17.09)
d04	5.01*** (16.71)	5.02*** (16.58)	6.48*** (18.44)	6.49*** (18.30)	13.70*** (22.03)	13.93*** (22.36)	14.55*** (19.25)	14.87*** (19.64)
d05	0.00 (.)		0.00 (.)		13.80*** (22.19)	14.04*** (22.55)	14.65*** (19.37)	14.99*** (19.80)
d06	0.00 (.)		0.00 (.)		15.36*** (24.70)	15.59*** (25.05)	15.25*** (20.16)	15.56*** (20.60)
dnyear0	0.14 (0.31)	0.18 (0.39)	0.07 (0.13)	0.11 (0.22)	2.26** (2.41)	2.16** (2.29)	0.63 (0.55)	0.47 (0.41)
doyear0	0.08 (0.15)	0.14 (0.28)	0.14 (0.25)	0.22 (0.37)	0.15 (0.14)	0.00 (0.00)	-0.34 (-0.26)	-0.54 (-0.42)
dpn	-0.10 (-0.29)	-0.14 (-0.39)	0.08 (0.20)	0.05 (0.11)	3.03*** (4.46)	2.84*** (4.20)	2.93*** (3.55)	2.62*** (3.21)
dpo	0.24 (0.63)	0.25 (0.64)	0.60 (1.32)	0.61 (1.33)	3.63*** (5.28)	3.43*** (5.04)	3.79*** (4.53)	3.53*** (4.28)
dpr	0.00 (.)	5.77*** (2.91)	0.00 (.)	7.27*** (3.21)	0.00 (.)	-1.20 (-0.57)	0.00 (.)	0.05 (0.02)
aceh	0.00 (.)	5.08* (1.95)	0.00 (.)	5.60* (1.89)	0.00 (.)	7.91*** (2.84)	0.00 (.)	6.92** (2.41)
papua	0.00 (.)	-9.28*** (-4.90)	0.00 (.)	-9.79*** (-4.53)	0.00 (.)	-14.62*** (-7.09)	0.00 (.)	-15.25*** (-7.12)
Constant	84.61*** (383.52)	84.02*** (132.04)	79.83*** (308.73)	79.16*** (108.94)	49.79*** (108.30)	50.16*** (64.97)	49.77*** (89.00)	50.12*** (59.62)
Observations	4,457	4,457	4,457	4,457	5,325	5,325	5,325	5,325
R-squared	0.21		0.25		0.30		0.24	

Table D5. Full sample estimates for education outcomes (continued)

Variable	NERSMA		NERSMAP		MYr		DOPSc	
	FE	RE	FE	RE	FE	RE	FE	RE
new06	-1.42*	-2.14***	-1.56*	-2.37***	-0.12***	-0.15***	0.26**	0.32***
	(-1.92)	(-2.98)	(-1.78)	(-2.79)	(-3.42)	(-4.37)	(2.10)	(2.95)
ori06	-1.59***	-2.33***	-2.03***	-2.83***	-0.08***	-0.11***	0.06	0.16**
	(-2.69)	(-4.09)	(-2.87)	(-4.22)	(-2.78)	(-4.00)	(0.64)	(1.96)
d95	-0.85	-0.85	-0.58	-0.58	0.02	0.02	0.14	0.14
	(-1.56)	(-1.55)	(-0.89)	(-0.89)	(0.83)	(0.83)	(1.54)	(1.51)
d96	0.30	0.30	0.50	0.50	0.13***	0.13***	-0.10	-0.10
	(0.55)	(0.56)	(0.77)	(0.77)	(5.25)	(5.23)	(-1.08)	(-1.09)
d97	2.90***	2.91***	3.82***	3.82***	0.16***	0.16***	-0.74***	-0.74***
	(5.35)	(5.33)	(5.91)	(5.89)	(6.45)	(6.43)	(-8.05)	(-8.05)
d98	3.32***	3.32***	4.22***	4.23***	0.24***	0.24***	-0.13	-0.13
	(6.11)	(6.09)	(6.52)	(6.51)	(9.51)	(9.48)	(-1.43)	(-1.43)
d99	4.20***	4.23***	5.91***	5.95***	0.33***	0.34***	-0.51***	-0.52***
	(7.60)	(7.62)	(8.98)	(9.01)	(13.22)	(13.21)	(-5.45)	(-5.48)
d00	4.70***	4.80***	5.76***	5.89***	0.41***	0.42***	-0.73***	-0.75***
	(8.04)	(8.18)	(8.27)	(8.44)	(15.43)	(15.51)	(-7.33)	(-7.52)
d01	3.96***	4.10***	5.13***	5.31***	-0.43***	-0.42***	-0.63***	-0.66***
	(6.98)	(7.21)	(7.60)	(7.84)	(-16.60)	(-16.26)	(-6.53)	(-6.88)
d02	4.79***	4.98***	5.67***	5.90***	0.07**	0.07***	-0.33***	-0.35***
	(8.30)	(8.58)	(8.25)	(8.55)	(2.52)	(2.78)	(-3.32)	(-3.59)
d03	6.49***	6.68***	7.49***	7.72***	0.09***	0.09***	-0.56***	-0.59***
	(11.16)	(11.45)	(10.82)	(11.12)	(3.28)	(3.52)	(-5.63)	(-5.96)
d04	9.76***	9.96***	10.41***	10.65***	0.16***	0.17***	-0.87***	-0.90***
	(16.71)	(16.98)	(14.95)	(15.26)	(6.04)	(6.27)	(-8.79)	(-9.12)
d05	10.58***	10.80***	11.46***	11.73***	0.22***	0.22***	-1.14***	-1.17***
	(18.10)	(18.40)	(16.46)	(16.81)	(8.02)	(8.26)	(-11.50)	(-11.85)
d06	11.59***	11.78***	12.64***	12.89***	0.25***	0.26***	-0.81***	-0.83***
	(19.82)	(20.10)	(18.15)	(18.49)	(9.30)	(9.54)	(-8.11)	(-8.43)
dnyear0	1.99**	1.87**	1.23	1.08	0.06	0.05	-0.21	-0.23
	(2.25)	(2.11)	(1.16)	(1.02)	(1.41)	(1.34)	(-1.41)	(-1.51)
doyear0	-0.17	-0.35	0.30	0.11	0.04	0.04	-0.40**	-0.34**
	(-0.17)	(-0.34)	(0.25)	(0.09)	(0.97)	(0.76)	(-2.32)	(-2.03)
dpn	4.27***	4.10***	3.78***	3.56***	0.12***	0.12***	-0.39***	-0.38***
	(6.69)	(6.44)	(4.97)	(4.69)	(4.07)	(3.97)	(-3.57)	(-3.64)
dpo	3.67***	3.50***	3.91***	3.69***	0.17***	0.16***	-0.45***	-0.39***
	(5.68)	(5.44)	(5.08)	(4.82)	(5.72)	(5.44)	(-4.05)	(-3.68)
dpr	0.00	-4.13*	0.00	-2.36	0.00	-0.30**	0.00	0.13
	(.)	(-1.65)	(.)	(-0.91)	(.)	(-2.05)	(.)	(0.71)
aceh	0.00	5.88*	0.00	6.25*	0.00	0.27	0.00	-0.39
	(.)	(1.77)	(.)	(1.83)	(.)	(1.40)	(.)	(-1.56)
papua	0.00	-10.85***	0.00	-11.01***	0.00	-0.33**	0.00	-0.05
	(.)	(-4.47)	(.)	(-4.38)	(.)	(-2.40)	(.)	(-0.25)
Constant	31.66***	32.26***	31.39***	31.89***	6.57***	6.60***	2.36***	2.36***
	(73.25)	(37.31)	(60.95)	(34.59)	(331.20)	(137.70)	(32.07)	(26.82)
Observations	5,324	5,324	5,320	5,320	5,325	5,325	5,325	5,325
R-squared	0.27		0.22		0.25		0.10	

Table D5. Full sample estimates for education outcomes (continued)

Variable	DOMSc		DOHSc	
	FE	RE	FE	RE
new06	-0.19 (-0.46)	1.01*** (3.02)	-0.40 (-0.47)	1.16* (1.77)
ori06	0.19 (0.58)	1.36*** (5.52)	-0.33 (-0.47)	1.81*** (3.82)
d95	0.62** (1.98)	0.59* (1.87)	1.21* (1.91)	1.20* (1.88)
d96	0.35 (1.12)	0.35 (1.11)	1.45** (2.31)	1.49** (2.36)
d97	0.51* (1.66)	0.52* (1.65)	1.40** (2.23)	1.45** (2.29)
d98	0.80*** (2.58)	0.79** (2.54)	0.90 (1.43)	0.95 (1.51)
d99	-0.10 (-0.32)	-0.12 (-0.38)	1.22* (1.91)	1.20* (1.87)
d00	-1.44*** (-4.32)	-1.57*** (-4.69)	-5.16*** (-7.62)	-5.42*** (-8.02)
d01	-1.75*** (-5.43)	-1.95*** (-6.03)	-5.28*** (-8.11)	-5.71*** (-8.81)
d02	0.66** (2.01)	0.51 (1.56)	1.64** (2.48)	1.21* (1.82)
d03	0.64* (1.95)	0.49 (1.49)	2.78*** (4.16)	2.30*** (3.46)
d04	-0.65* (-1.96)	-0.80** (-2.42)	0.60 (0.89)	0.11 (0.16)
d05	-0.09 (-0.28)	-0.29 (-0.88)	2.74*** (4.08)	2.23*** (3.35)
d06	-0.52 (-1.56)	-0.76** (-2.30)	4.65*** (6.92)	4.05*** (6.10)
dnyear0	-0.74 (-1.46)	-0.59 (-1.17)	-0.82 (-0.81)	-0.21 (-0.21)
doyear0	-0.20 (-0.35)	-0.20 (-0.36)	-0.23 (-0.20)	-0.02 (-0.02)
dpn	-1.67*** (-4.58)	-1.53*** (-4.42)	-3.27*** (-4.34)	-2.25*** (-3.22)
dpo	-1.11*** (-3.03)	-1.22*** (-3.56)	-0.96 (-1.30)	-0.97 (-1.45)
dpr	0.00 (.)	0.45 (1.03)	0.00 (.)	2.93*** (3.67)
aceh	0.00 (.)	-0.92 (-1.62)	0.00 (.)	-0.26 (-0.26)
papua	0.00 (.)	0.91** (1.99)	0.00 (.)	1.57* (1.80)
Constant	5.04*** (20.43)	4.62*** (17.88)	10.70*** (21.42)	9.87*** (19.48)
Observations	5,314	5,314	5,251	5,251
R-squared	0.05		0.09	

Table D6. Restricted sample estimates for health outcomes

Variable	IMR		U5MR		LEAB		SURate	
	FE	RE	FE	RE	FE	RE	FE	RE
new06	0.00 (.)	0.00 (0.92)	0.00 (.)	0.04*** (13.40)	0.00 (.)	-0.11 (-0.19)	-1.26 (-1.25)	-1.83* (-1.96)
d95	0.00 (1.10)	0.00 (1.08)	0.00 (.)		-1.09 (-1.24)	-1.07 (-1.22)	-0.03 (-0.02)	0.07 (0.05)
d96	0.00 (0.88)	0.00 (0.86)	0.02*** (4.43)		-0.77 (-0.88)	-0.76 (-0.87)	-2.61* (-1.92)	-2.60* (-1.90)
d97	0.00 (0.14)	-0.00 (-0.04)	0.01*** (3.59)	-0.02*** (-4.64)	-0.03 (-0.05)	0.10 (0.14)	3.72*** (2.74)	3.72*** (2.72)
d98	-0.00 (-1.00)	-0.00 (-1.11)	0.01*** (3.27)	-0.02*** (-4.79)	0.66 (0.94)	0.75 (1.08)	-15.02*** (-11.30)	-14.77*** (-11.11)
d99	-0.00 (-1.02)	-0.00 (-1.24)	0.01*** (2.96)	-0.02*** (-5.12)	0.70 (1.00)	0.86 (1.23)	-13.83*** (-10.05)	-13.61*** (-9.88)
d00	-0.01** (-2.46)	-0.01*** (-2.75)	0.00 (.)	-0.03*** (-6.57)	1.71** (2.41)	1.91*** (2.71)	-23.40*** (-15.94)	-23.64*** (-16.10)
d01	-0.00 (-0.73)	-0.00 (-1.11)	0.01*** (3.20)	-0.02*** (-5.02)	0.48 (0.69)	0.74 (1.06)	-21.63*** (-15.60)	-21.70*** (-15.66)
d02	-0.01** (-2.26)	-0.01*** (-2.62)	0.00 (0.53)	-0.03*** (-6.39)	1.64** (2.33)	1.88*** (2.69)	-24.43*** (-17.06)	-24.51*** (-17.17)
d03	-0.01*** (-3.06)	-0.01*** (-3.39)	0.00 (0.54)	-0.03*** (-6.41)	2.28*** (3.26)	2.50*** (3.61)	-21.45*** (-14.72)	-21.89*** (-15.18)
d04	-0.02*** (-5.50)	-0.02*** (-5.82)	-0.01** (-2.53)	-0.03*** (-7.97)	4.21*** (6.06)	4.42*** (6.39)	-23.94*** (-16.46)	-24.40*** (-17.04)
d05	-0.02*** (-5.90)	-0.02*** (-6.18)	-0.01*** (-3.90)	-0.03*** (-8.67)	4.42*** (6.36)	4.60*** (6.65)	-28.85*** (-20.30)	-28.99*** (-20.69)
d06	-0.01*** (-3.59)	-0.01*** (-3.89)	-0.00 (-1.04)	-0.03*** (-7.15)	3.03*** (4.37)	3.23*** (4.68)	-29.22*** (-20.48)	-29.40*** (-20.93)
dnyear0	-0.00 (-0.78)	-0.00 (-0.76)	-0.00 (-1.40)	-0.00 (-1.31)	0.41 (0.69)	0.40 (0.68)	-3.25** (-2.20)	-3.11** (-2.14)
doyear0	0.00 (1.45)	0.01* (1.84)	0.00 (1.26)	0.01*** (3.69)	-0.85 (-1.28)	-1.10* (-1.67)	-0.39 (-0.25)	-0.21 (-0.13)
dpn	-0.00*** (-2.68)	-0.00*** (-2.73)	-0.02*** (-6.87)	-0.02*** (-6.96)	0.82** (2.03)	0.84** (2.09)	-0.36 (-0.29)	0.16 (0.14)
dpr	0.00 (.)	0.01* (1.82)	0.00 (.)	0.01 (1.64)	0.00 (.)	-1.53* (-1.80)	0.00 (.)	-0.73 (-0.44)
aceh	0.00 (.)	-0.01* (-1.70)	0.00 (.)	-0.00 (-0.07)	0.00 (.)	1.65* (1.65)	0.00 (.)	6.22*** (2.84)
papua	0.00 (.)	0.00 (1.32)	0.00 (.)	0.01* (1.88)	0.00 (.)	-0.76 (-0.97)	0.00 (.)	11.40*** (5.87)
Constant	0.05*** (17.64)	0.05*** (16.88)	0.04*** (22.11)	0.05*** (13.20)	65.09*** (101.18)	64.99*** (96.05)	65.16*** (64.48)	64.11*** (53.55)
Observations	4,255	4,255	4,113	4,113	4,255	4,255	2,357	2,357
R-squared	0.08		0.08		0.10		0.45	

Table D6. Restricted sample estimates for health outcomes (continued)

Variable	BAtt		DPT		Pol		KB	
	FE	RE	FE	RE	FE	RE	FE	RE
new06	0.76 (0.62)	0.74 (0.63)	2.86* (1.93)	2.90** (2.10)	1.91 (1.28)	1.71 (1.24)	1.02 (1.47)	0.83 (1.21)
d95	2.23 (1.35)	2.36 (1.41)	-2.70 (-1.52)	-5.15*** (-3.30)	-11.62*** (-6.51)		2.87*** (3.03)	2.88*** (3.03)
d96	8.23*** (5.03)	8.27*** (5.02)	-0.85 (-0.48)	-3.20** (-2.09)	-4.72*** (-2.68)	6.98*** (4.46)	2.48*** (2.65)	2.47*** (2.63)
d97	11.75*** (7.15)	11.80*** (7.13)	2.36 (1.34)		1.27 (0.72)	12.97*** (8.28)	4.95*** (5.30)	4.94*** (5.26)
d98	9.07*** (5.66)	9.12*** (5.67)	1.11 (0.66)	-1.42 (-0.94)	0.40 (0.24)	11.94*** (7.75)	5.20*** (5.70)	5.22*** (5.70)
d99	19.76*** (11.87)	19.76*** (11.82)	3.96** (2.15)	1.47 (0.87)	-1.96 (-1.06)	9.64*** (5.64)	4.67*** (4.94)	4.69*** (4.94)
d00	22.36*** (12.58)	22.12*** (12.40)	0.00 (.)		0.00 (.)		2.30** (2.28)	2.28** (2.26)
d01	23.61*** (14.13)	23.44*** (13.98)	0.00 (.)		0.00 (.)		0.62 (0.65)	0.56 (0.59)
d02	23.44*** (13.58)	23.26*** (13.44)	0.00 (.)		0.00 (.)		2.57*** (2.61)	2.51** (2.55)
d03	26.40*** (15.02)	25.84*** (14.72)	0.00 (.)		0.00 (.)		3.86*** (3.86)	3.64*** (3.64)
d04	28.80*** (16.41)	28.03*** (16.02)	-4.68*** (-3.41)	-7.44*** (-4.19)	-10.54*** (-7.66)	0.65 (0.36)	6.31*** (6.32)	6.04*** (6.05)
d05	26.69*** (15.57)	26.16*** (15.31)	-1.85 (-1.41)	-4.52*** (-2.66)	-7.36*** (-5.59)	3.99** (2.31)	6.78*** (6.95)	6.61*** (6.78)
d06	28.01*** (16.28)	27.45*** (16.01)	0.00 (.)	-2.70 (-1.58)	0.00 (.)	11.33*** (6.53)	7.74*** (7.90)	7.57*** (7.73)
dnyear0	-4.69*** (-2.64)	-4.13** (-2.33)	-4.09 (-1.39)	-3.84 (-1.32)	-1.85 (-0.62)	-1.84 (-0.63)	-1.96* (-1.94)	-1.81* (-1.79)
doyear0	-0.89 (-0.46)	-0.99 (-0.52)	-1.68 (-0.53)	-2.02 (-0.65)	-1.30 (-0.41)	-1.58 (-0.51)	-0.31 (-0.29)	-0.36 (-0.33)
dpn	-5.20*** (-3.45)	-4.43*** (-3.02)	-1.48 (-0.74)	-1.50 (-0.80)	-1.07 (-0.53)	-1.07 (-0.57)	-2.72*** (-3.20)	-2.37*** (-2.83)
dpr	0.00 (.)	-1.52 (-0.49)	0.00 (.)	-3.85 (-1.42)	0.00 (.)	-3.57 (-1.37)	0.00 (.)	-3.67 (-1.56)
aceh	0.00 (.)	6.61 (1.59)	0.00 (.)	-17.66*** (-4.99)	0.00 (.)	-13.78*** (-4.07)	0.00 (.)	-12.15*** (-3.86)
papua	0.00 (.)	-10.73*** (-2.97)	0.00 (.)	-3.64 (-1.16)	0.00 (.)	-0.67 (-0.22)	0.00 (.)	-19.62*** (-7.22)
Constant	38.80*** (31.84)	39.63*** (22.26)	34.73*** (26.18)	38.97*** (24.43)	42.89*** (32.16)	32.61*** (20.54)	45.75*** (65.92)	47.82*** (39.33)
Observations	2,349	2,349	1,504	1,504	1,504	1,504	2,360	2,360
R-squared	0.25		0.04		0.12		0.07	

Table D6. Restricted sample estimates for education outcomes

Variable	AdLit		AdLitP		NERSMP		NERSMPP	
	FE	RE	FE	RE	FE	RE	FE	RE
new06	-1.50*** (-3.11)	-1.11** (-2.39)	-1.75*** (-3.11)	-1.34** (-2.46)	-0.29 (-0.35)	-0.08 (-0.10)	0.05 (0.05)	0.32 (0.33)
d95	-1.41** (-2.52)	-1.39** (-2.47)	-1.72*** (-2.63)	-1.69*** (-2.58)	-0.77 (-0.68)	-0.79 (-0.69)	-0.74 (-0.53)	-0.76 (-0.55)
d96	-0.07 (-0.13)	-0.06 (-0.11)	-0.02 (-0.03)	-0.01 (-0.02)	2.77** (2.46)	2.78** (2.47)	4.11*** (3.00)	4.13*** (3.02)
d97	1.62*** (2.92)	1.63*** (2.93)	1.88*** (2.91)	1.89*** (2.92)	6.64*** (5.91)	6.65*** (5.92)	7.40*** (5.40)	7.42*** (5.42)
d98	2.67*** (4.93)	2.70*** (4.97)	3.25*** (5.13)	3.29*** (5.19)	6.11*** (5.55)	6.16*** (5.62)	6.50*** (4.85)	6.53*** (4.89)
d99	2.84*** (5.05)	2.86*** (5.07)	3.63*** (5.52)	3.65*** (5.55)	7.96*** (6.98)	8.02*** (7.06)	9.73*** (7.00)	9.76*** (7.06)
d00	1.68*** (2.79)	1.69*** (2.80)	2.62*** (3.74)	2.63*** (3.74)	8.22*** (6.77)	8.29*** (6.85)	9.77*** (6.60)	9.84*** (6.68)
d01	3.33*** (5.87)	3.37*** (5.93)	4.35*** (6.57)	4.39*** (6.62)	10.27*** (8.95)	10.35*** (9.06)	12.26*** (8.76)	12.33*** (8.87)
d02	3.95*** (6.73)	4.01*** (6.82)	5.39*** (7.86)	5.44*** (7.93)	9.28*** (7.83)	9.38*** (7.96)	10.34*** (7.16)	10.46*** (7.29)
d03	4.03*** (6.68)	4.12*** (6.84)	5.77*** (8.19)	5.85*** (8.32)	12.95*** (10.75)	13.09*** (10.96)	14.48*** (9.86)	14.63*** (10.07)
d04	4.66*** (7.67)	4.71*** (7.77)	6.40*** (9.02)	6.43*** (9.09)	16.60*** (13.80)	16.73*** (14.07)	17.76*** (12.11)	17.90*** (12.39)
d05	0.00 (.)		0.00 (.)		16.68*** (14.18)	16.80*** (14.44)	17.71*** (12.35)	17.85*** (12.62)
d06	0.00 (.)		0.00 (.)		18.56*** (15.72)	18.67*** (16.00)	18.81*** (13.07)	18.92*** (13.34)
dnyear0	0.31 (0.52)	0.39 (0.65)	0.06 (0.08)	0.16 (0.23)	1.39 (1.14)	1.42 (1.18)	-0.36 (-0.24)	-0.36 (-0.25)
doyear0	-0.13 (-0.20)	-0.09 (-0.14)	-0.24 (-0.32)	-0.20 (-0.26)	-1.29 (-0.98)	-1.21 (-0.93)	-2.20 (-1.38)	-2.08 (-1.31)
dpn	0.40 (0.71)	0.30 (0.55)	0.35 (0.54)	0.29 (0.46)	0.98 (0.96)	0.81 (0.82)	0.74 (0.59)	0.45 (0.37)
dpr	0.00 (.)	0.78 (0.53)	0.00 (.)	1.44 (0.82)	0.00 (.)	0.12 (0.06)	0.00 (.)	1.33 (0.62)
aceh	0.00 (.)	-0.43 (-0.22)	0.00 (.)	-0.90 (-0.39)	0.00 (.)	8.79*** (3.27)	0.00 (.)	7.95*** (2.77)
papua	0.00 (.)	-14.95*** (-8.87)	0.00 (.)	-16.84*** (-8.32)	0.00 (.)	-16.09*** (-6.88)	0.00 (.)	-16.57*** (-6.60)
Constant	86.84*** (208.98)	87.96*** (118.20)	82.36*** (169.65)	83.64*** (94.27)	45.39*** (54.26)	46.07*** (39.10)	45.39*** (44.52)	45.95*** (34.23)
Observations	1,923	1,923	1,923	1,923	2,360	2,360	2,360	2,360
R-squared	0.13		0.17		0.27		0.21	

Table D6. Restricted sample estimates for education outcomes (continued)

Variable	NERSMA		NERSMAP		MYr		DOPSc	
	FE	RE	FE	RE	FE	RE	FE	RE
new06	-0.87 (-1.11)	-0.62 (-0.81)	-0.85 (-0.92)	-0.56 (-0.63)	-0.02 (-0.66)	-0.02 (-0.51)	0.17 (1.28)	0.08 (0.67)
d95	-1.62 (-1.49)	-1.62 (-1.49)	-1.77 (-1.40)	-1.76 (-1.40)	-0.01 (-0.12)	-0.01 (-0.12)	0.38** (2.12)	0.38** (2.14)
d96	-0.34 (-0.32)	-0.33 (-0.31)	-0.51 (-0.41)	-0.50 (-0.40)	0.11** (2.44)	0.11** (2.45)	-0.20 (-1.13)	-0.20 (-1.14)
d97	2.67** (2.51)	2.68** (2.51)	4.23*** (3.40)	4.23*** (3.41)	0.19*** (4.23)	0.19*** (4.24)	-0.77*** (-4.36)	-0.77*** (-4.36)
d98	3.30*** (3.17)	3.35*** (3.21)	4.36*** (3.59)	4.42*** (3.64)	0.28*** (6.42)	0.28*** (6.51)	-0.25 (-1.45)	-0.26 (-1.54)
d99	4.53*** (4.20)	4.59*** (4.25)	6.49*** (5.16)	6.55*** (5.22)	0.40*** (8.96)	0.40*** (9.04)	-0.61*** (-3.40)	-0.61*** (-3.42)
d00	3.80*** (3.30)	3.86*** (3.35)	3.70*** (2.75)	3.79*** (2.82)	0.41*** (8.59)	0.41*** (8.62)	-0.78*** (-4.09)	-0.79*** (-4.17)
d01	4.83*** (4.44)	4.90*** (4.51)	6.06*** (4.78)	6.13*** (4.85)	-0.32*** (-7.13)	-0.32*** (-7.09)	-0.87*** (-4.84)	-0.87*** (-4.87)
d02	5.69*** (5.07)	5.75*** (5.13)	6.41*** (4.90)	6.49*** (4.97)	0.19*** (4.10)	0.19*** (4.13)	-0.51*** (-2.76)	-0.50*** (-2.70)
d03	8.01*** (7.02)	8.12*** (7.14)	8.69*** (6.52)	8.79*** (6.63)	0.25*** (5.36)	0.25*** (5.37)	-0.96*** (-5.08)	-0.94*** (-5.03)
d04	12.97*** (11.38)	13.02*** (11.48)	13.04*** (9.81)	13.11*** (9.94)	0.36*** (7.64)	0.36*** (7.64)	-1.39*** (-7.33)	-1.35*** (-7.31)
d05	13.96*** (12.52)	14.05*** (12.67)	14.39*** (11.07)	14.49*** (11.24)	0.38*** (8.26)	0.38*** (8.26)	-1.55*** (-8.36)	-1.52*** (-8.39)
d06	16.03*** (14.33)	16.09*** (14.46)	17.50*** (13.41)	17.56*** (13.58)	0.42*** (9.20)	0.42*** (9.20)	-1.16*** (-6.22)	-1.13*** (-6.21)
dnyear0	0.53 (0.46)	0.57 (0.50)	-0.36 (-0.27)	-0.28 (-0.21)	-0.04 (-0.78)	-0.03 (-0.62)	-0.03 (-0.18)	-0.12 (-0.63)
doyear0	-1.04 (-0.84)	-1.00 (-0.80)	-0.72 (-0.50)	-0.63 (-0.44)	-0.07 (-1.29)	-0.07 (-1.32)	-0.14 (-0.70)	-0.14 (-0.67)
dpn	1.53 (1.58)	1.36 (1.43)	1.14 (1.01)	0.93 (0.84)	-0.03 (-0.76)	-0.02 (-0.60)	-0.07 (-0.44)	-0.11 (-0.76)
dpr	0.00 (.)	0.11 (0.04)	0.00 (.)	1.22 (0.48)	0.00 (.)	-0.06 (-0.57)	0.00 (.)	0.20 (0.99)
aceh	0.00 (.)	7.61** (2.35)	0.00 (.)	7.06** (2.08)	0.00 (.)	0.33** (2.15)	0.00 (.)	-0.41 (-1.53)
papua	0.00 (.)	-11.85*** (-4.22)	0.00 (.)	-13.37*** (-4.53)	0.00 (.)	-0.38*** (-2.88)	0.00 (.)	0.10 (0.42)
Constant	26.21*** (33.07)	26.76*** (20.69)	26.43*** (28.60)	26.98*** (19.14)	6.23*** (191.11)	6.25*** (107.65)	2.64*** (20.04)	2.67*** (17.61)
Observations	2,360	2,360	2,356	2,356	2,360	2,360	2,360	2,360
R-squared	0.27		0.22		0.22		0.10	

Table D6. Restricted sample estimates for education outcomes (continued)

Variable	DOMSc		DOHSc	
	FE	RE	FE	RE
new06	-0.19 (-0.40)	-0.15 (-0.35)	-0.09 (-0.10)	-0.94 (-1.14)
d95	0.76 (1.14)	0.67 (1.01)	0.65 (0.50)	0.51 (0.39)
d96	0.39 (0.60)	0.40 (0.61)	2.42* (1.88)	2.41* (1.88)
d97	0.39 (0.60)	0.40 (0.61)	0.72 (0.57)	0.69 (0.54)
d98	0.53 (0.83)	0.42 (0.66)	0.61 (0.48)	0.39 (0.31)
d99	-0.59 (-0.88)	-0.67 (-1.02)	1.06 (0.81)	0.92 (0.71)
d00	-1.49** (-2.09)	-1.60** (-2.27)	-5.48*** (-3.92)	-5.48*** (-3.97)
d01	-2.35*** (-3.49)	-2.42*** (-3.65)	-5.91*** (-4.54)	-6.10*** (-4.75)
d02	0.50 (0.72)	0.42 (0.62)	0.04 (0.03)	-0.20 (-0.15)
d03	0.33 (0.46)	0.18 (0.26)	1.44 (1.05)	1.36 (1.02)
d04	-1.83*** (-2.59)	-2.02*** (-2.97)	-2.18 (-1.60)	-2.36* (-1.79)
d05	-1.42** (-2.06)	-1.66** (-2.49)	0.49 (0.37)	0.21 (0.17)
d06	-2.07*** (-3.00)	-2.32*** (-3.48)	1.70 (1.27)	1.45 (1.13)
dnyear0	-0.49 (-0.69)	-0.42 (-0.62)	-0.02 (-0.01)	-0.06 (-0.05)
doyear0	0.12 (0.16)	-0.08 (-0.11)	-0.64 (-0.43)	-0.90 (-0.62)
dpr	-0.87 (-1.45)	-0.69 (-1.31)	-1.34 (-1.13)	-0.62 (-0.61)
dpr	0.00 (.)	0.09 (0.16)	0.00 (.)	1.31 (1.20)
aceh	0.00 (.)	-1.24 (-1.63)	0.00 (.)	-0.95 (-0.66)
papua	0.00 (.)	1.09 (1.57)	0.00 (.)	1.73 (1.23)
Constant	6.28*** (12.80)	6.28*** (11.98)	13.12*** (13.69)	13.11*** (12.90)
Observations	2,352	2,352	2,301	2,301
R-squared	0.05		0.05	

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